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(R-2008-401) 11/13

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MEET

RESOLUTION NUMBER R- 303177

DATE OF FINAL PASSAGE NOV 20 2007

A RESOLUTION ADOPTING THE SAN PASQUAL GROUNDWATER MANAGEMENT PLAN; AND RELATED ACTIONS.

BE IT RESOLVED, by the Council of the City of San Diego, as follows:

1. That the City Council has received the San Pasqual Groundwater Management Plan on file in the office of the City Clerk as Document No. RR- 303177 and all public comments for the San Pasqual Groundwater Management Plan.

2. That the San Pasqual Groundwater Management Plan is hereby adopted.

3. That this activity is exempt from the California Environmental Quality Act [CEQA] pursuant to CEQA Guidelines section 15262 and this determination is based on CEQA Guidelines section 15004 which provides direction to lead agencies on the appropriate timing for environmental review. This project will require further review under the provisions of CEQA.

APPROVED: MICHAEL J. AGUIRRE, City Attorney

By _____
Raymond C. Palmucci
Deputy City Attorney

RCP:js
11/6/2007
Or.Dept:Water
R-2008-401

I hereby certify that the foregoing Resolution was passed by the Council of the City of San Diego, at this meeting of NOV 13 2007.

ELIZABETH S. MALAND
City Clerk

By Lara Richardson
Deputy City Clerk

Approved: 11-20-07
(date)

JERRY SANDERS, Mayor

Vetoed: _____
(date)

JERRY SANDERS, Mayor

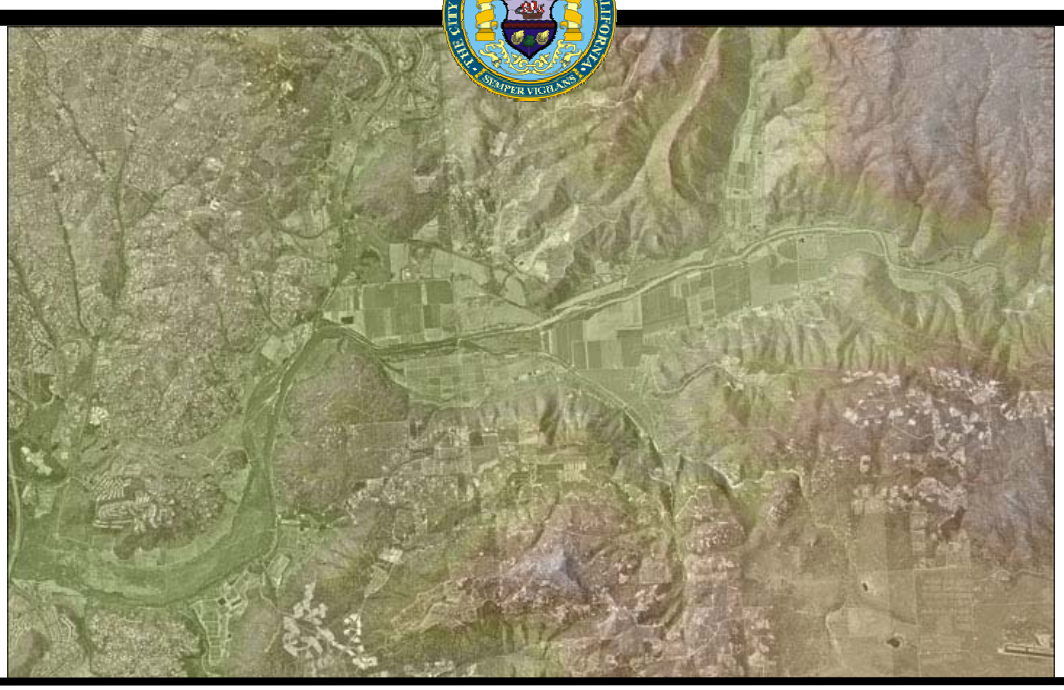
R- 303177

SAN PASQUAL

NOVEMBER 2007

GROUNDWATER MANAGEMENT PLAN

CITY OF SAN DIEGO



San Pasqual Basin Groundwater Management Plan

Adopted November 2007

San Pasqual Basin
Groundwater Management Plan

The City of San Diego Water Department

Document Prepared by:

City of San Diego Water Department

MWH Americas, Inc. **Katz & Associates**

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Bob Perotti	Department of Water Resources
Frank Konyn, Jr.	Konyn Dairy
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Section 1 – Introduction

1.1 INTRODUCTION

San Diego has developed this Groundwater Management Plan for the San Pasqual Valley groundwater basin, referred to hereafter as the San Pasqual Groundwater Management Plan (SPGMP). This document represents a "beginning" point for understanding how to best manage the basin. This is an "adaptive management" plan and future actions will result from careful evaluation of basin response to past actions.

The SPGMP area, illustrated in **Figure 1-1**, is located within the San Dieguito Drainage Basin, which is the fourth largest drainage basin in San Diego County.

An extensive outreach effort has been conducted as part of the SPGMP development. A Project Advisory Committee (PAC) was formed to provide input to the City of San Diego during the development of the SPGMP. Appendix G details the overall outreach approach and activities.

This section provides a general background of this SPGMP effort and describes San Diego's existing and future groundwater resource planning activities within the SPGMP and adjacent areas. This section also includes a summary of other regional planning efforts within San Diego County, but outside of SPGMP area (**Figure 1-1)**.

1.2 REPORT ORGANIZATION

This section briefly describes the report organization.

Section 1. Introduction. Provides information on the geographic setting, jurisdictional boundaries and general background of San Diego and adjacent cities and water agencies. In addition, this section summarizes other Groundwater Management Plans (GMPs) and management efforts adjacent to the SPGMP area or related to San Diego's Water Department.

Section 2. Water Resources. Prior to managing a basin, available water supplies should be identified and quantified. In this section, information is presented to assist the reader in understanding the availability of different water supplies within the SPGMP area. This section also provides a description of the groundwater basin, highlighting the unique

hydrogeology within the SPGMP area. It also provides an understanding of water quality issues, and the groundwater and surface water infrastructure.

Section 3. Management Plan Elements. This section identifies the five components categories that constitute a groundwater management plan. An important aspect of this section is the identification of Basin Management Objectives (BMOs), component categories, and the actions necessary for their implementation.

Section 4. Plan Implementation. This section provides a schedule for implementing the BMOs, component categories, and actions provided in Section 3, including a presentation of reporting criteria. In addition, this section provides a description of the schedule and financing necessary to implement the SPGMP.

1.3 PURPOSE AND GOALS OF SPGMP

San Diego has prepared the following goal statement early in the development of the Groundwater Management Plan:

> *"The goal of the SPGMP is to understand and enhance the long-term sustainability and quality of groundwater within the basin, and protect this groundwater resource for beneficial uses including water supply, agriculture, and the environment."*

The purpose of this SPGMP is to serve as the initial framework for coordinating the management activities into a cohesive set of Basin Management Objectives (BMOs) and related actions to improve management of the groundwater resource in San Pasqual Valley.

1.4 SPGMP AREA

The SPGMP area boundary coincides with the California Department of Water Resources (DWR) San Pasqual Valley groundwater basin boundary as defined in Bulletin 118 and illustrated in **Figure 1-2**.[1]

[1] The basin boundary shown on this figure and presented in this GMP has been slightly modified from Bulletin 118 to better represent the physical conditions within the basin.

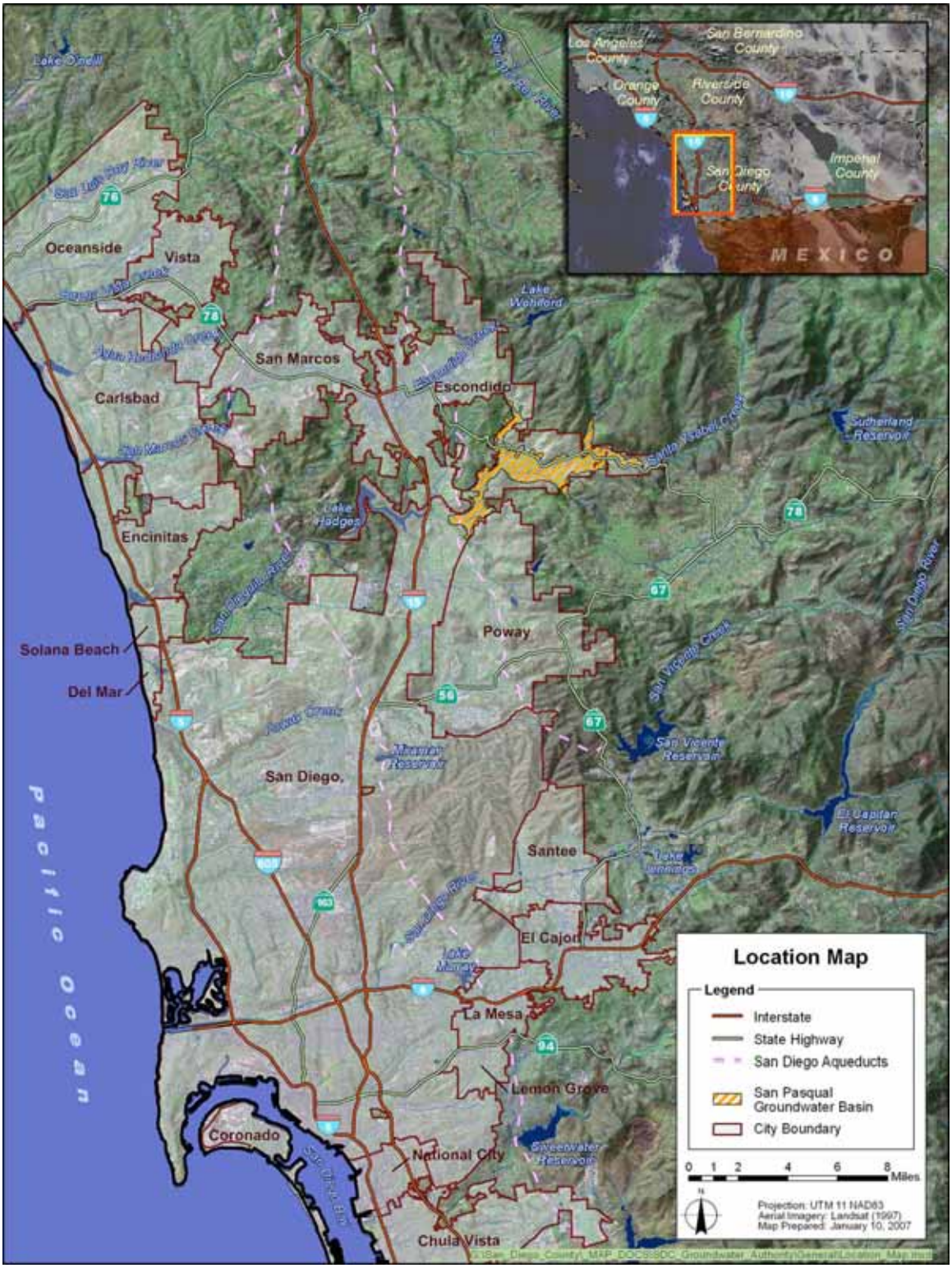

Figure 1-1 – San Pasqual GMP Area and Regional Setting

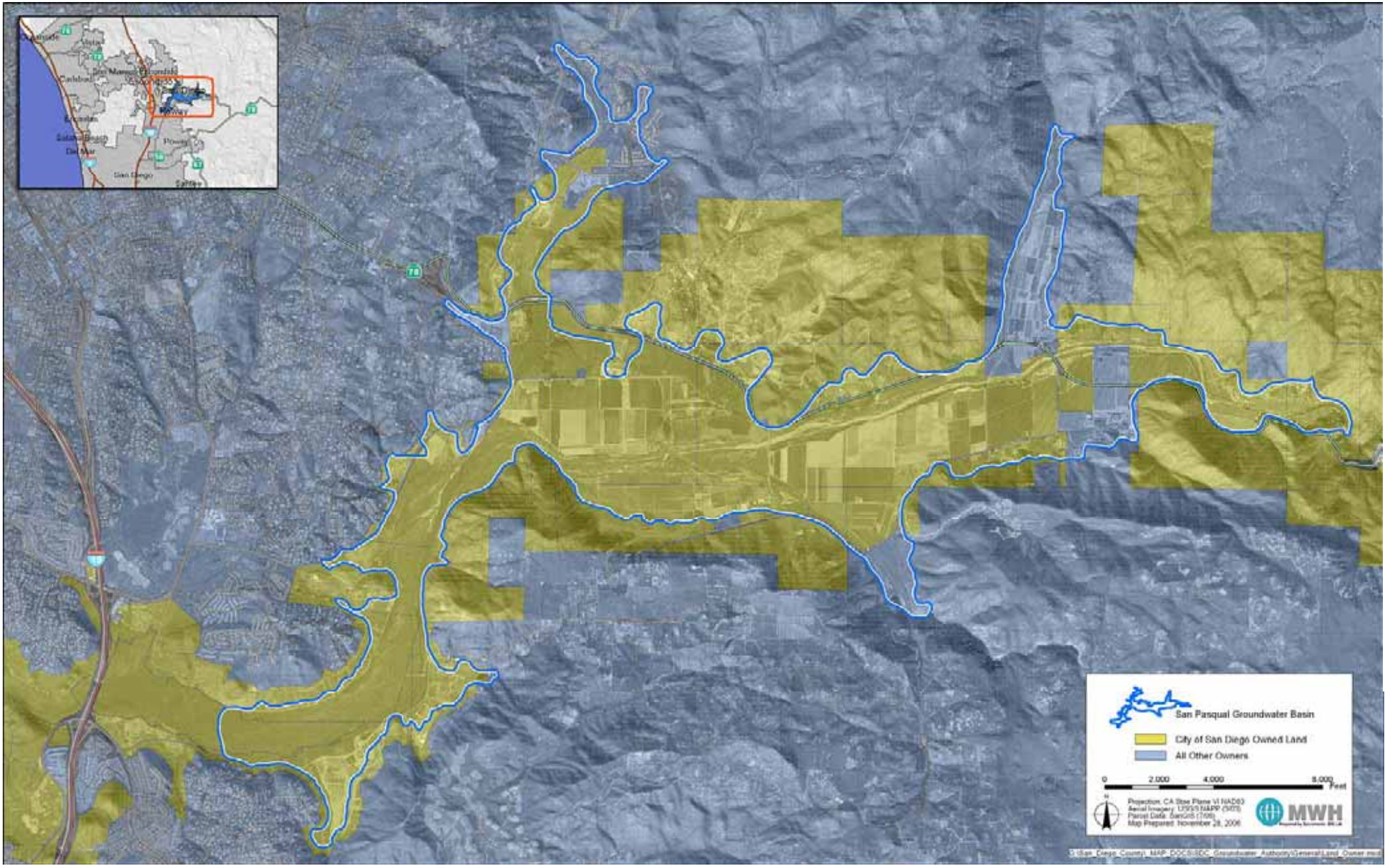

Figure 1-2 – San Pasqual Groundwater Basin Boundary[1], and City Land Ownership within the San Pasqual Valley

1.5 BACKGROUND

The following subsection provides background information on the City of San Diego, other relevant adjacent cities and water agencies surrounding the SPGMP area, and other stakeholders in the region.

1.5.1 City of San Diego

The City of San Diego is located on the southern coast of California near the Mexico border (**Figure 1-1**). The City of San Diego was the third city to be established within California in 1850. The City population in 2005 was 1,305,736 (State Department of Finance, Demographic Research Unit, 2005). The population is expected to grow to as many as 1,656,820 people by the year 2030, according to the 2030 SANDAG Regional Growth Forecast (SANDAG, 2004). This represents an approximate increase of 27 percent, over 25 years.

The City of San Diego's Water Department provides municipal water supply to its service customers. The current source of water is imported supplies via the San Diego County Water Authority (SDCWA) aqueducts, as well as from nine reservoirs fed from local runoff.

The City of San Diego's Long Range Water Resources Plan (LRWRP) outlines ways to meet future water demands, which are estimated to increase by 55 million gallons per day (MGD) or 25% over 2002 levels by the year 2030. The LRWRP outlines the use of imported water supplies and ways to improve reliability by diversifying water supply. This diversification of water supply includes:

- Development of potential groundwater resources and storage capacity, combined with surface water management to meet overall water supply and resource management objectives;
- Expansion of recycled water programs;
- Investigation and pursuit of non-traditional water supplies such as brackish groundwater and seawater desalination; and
- Pursuing water transfers.

In 1995, San Diego adopted the San Pasqual Valley Plan that includes specific goals aimed at the long-term protection and management of the San Pasqual Valley (Valley). The San Pasqual Valley Plan is now included within the City's LRWRP. The Valley was also identified as a region for development of potential groundwater resources. The City of San Diego is responsible for following through with directives written in the San Pasqual Valley Plan. The directives include the following:

- Establish a Prohibition of any Further Commercialization of the Valley;
- Tailor Zoning Within the Valley to Ensure the Preservation of the Valley's Existing Rural Character and to Encourage Appropriate Agricultural Uses;
- Protect the Quality and Capacity of the San Pasqual/Lake Hodges Surface Water and Groundwater Basin;
- Protect, Enhance and Restore the Sensitive Habitats within the Valley;
- Promote Passive Recreation and Interpretive Uses in the Valley;
- Preserve, Promote, and Sustain Agricultural Uses;
- Build Consensus Through Collaborative Partnerships Among the Adjacent Jurisdictions and Other Entities with an Interest in this Area to Preserve the Qualities and Resources of the Valley;
- Establish an Interpretive Center in the Valley;
- Inform the San Pasqual/Lake Hodges Community Planning Group and the Rancho Bernardo Community Planning Board of all Planning and Land Use Issues that Pertain to the Valley Plan Area; and
- Ensure the Long-Term Protection of the Valley's Unique Agricultural, Biological, and Water Resources.
- In 2004, the San Pasqual Vision Plan was presented to the City Council. In 2005, the City Council adopted Council Policy 600-45, which reinforces the goal of vision plan, and also requires development of a Groundwater Management Plan.

1.5.2 Other Adjacent Agencies

The following sub section provides background information on adjacent cities and water agencies to the SPGMP area as illustrated in **Figure 1-3**.

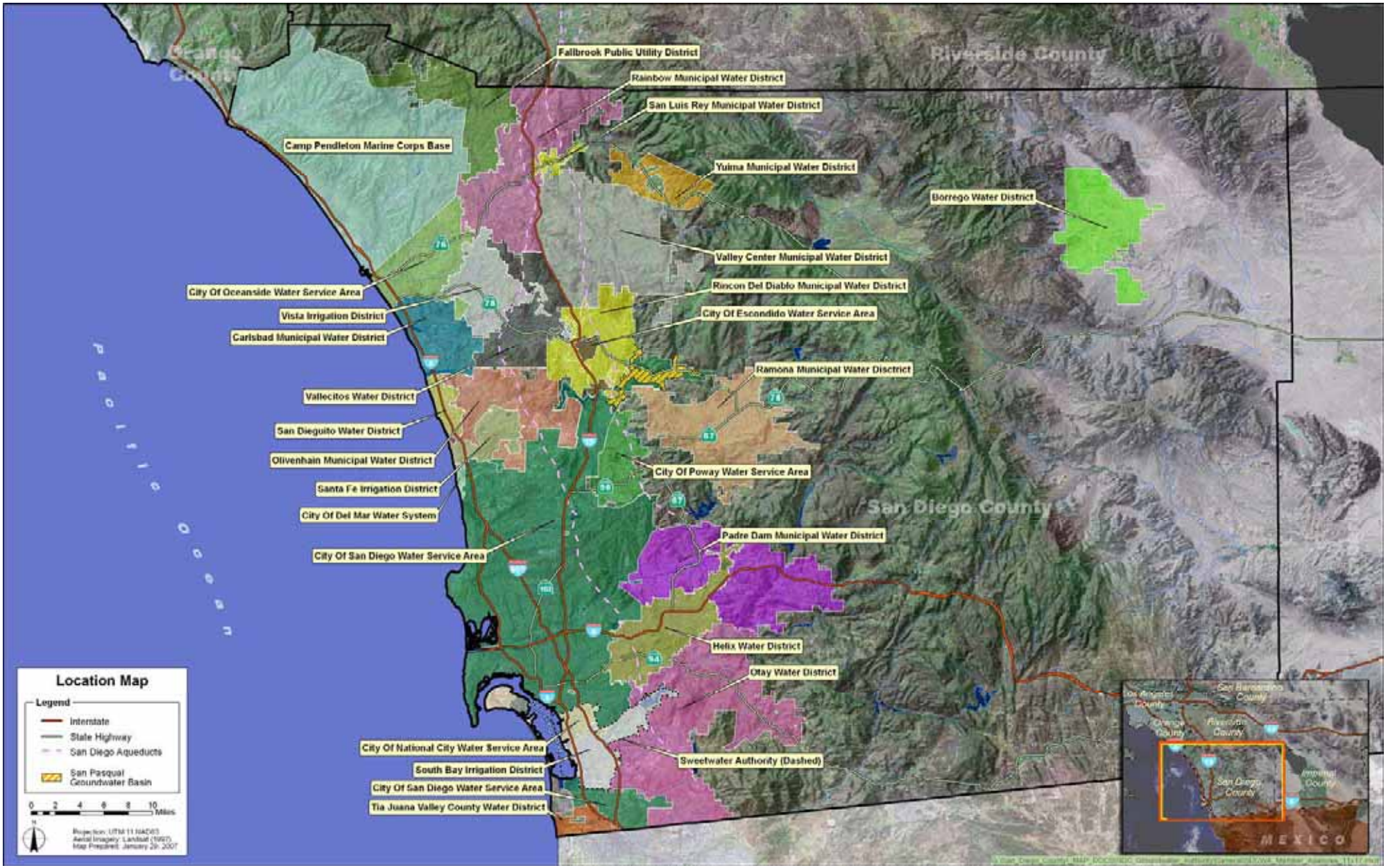

Figure 1-3 - Adjacent City and Water Agency's Service Areas

1.5.2.1 San Diego County

The County of San Diego reported a population of 2,933,462 people in 2005. The communities and cities which make up the County of San Diego are included in the **Table 1-1** below.

Table 1-1 – Communities and Cities within San Diego County

Alpine	City of Del Mar
Bonsall	City of El Cajon
Borrego Springs	City of Encinitas
Cardiff-by-the-Sea	City of Escondido
Chula Vista	City of Imperial Beach
Fallbrook	La Jolla
Golden Triangle	City of La Mesa
Julian	City of Lemon Grove
City of Lakeside	City of National City
Otay Mesa	City of Oceanside
Poway	Rancho Santa Fe
Ramona	City of Santee
San Ysidro	City of San Diego
Spring Valley	City of San Marcos
City of Carlsbad	City of Solana Beach
City of Chula Vista	City of Vista
City of Coronado	

1.5.2.2 San Diego County Water Authority

The San Diego County Water Authority (SDCWA) was formed in 1944 by the California State Legislature, and is operated under the County Water Authority Act, found in the California Water Code. SDCWA is a member of the Metropolitan Water District of Southern California (MWD) and has supplied up to 90 percent of San Diego County's water over its 60-year history. SDCWA's mission as the regional wholesaler of imported water is to provide a safe and reliable supply of water to its 23 member agencies, which supply approximately 97 percent of the water to San Diego County's 2.9 million residents. The member agencies in San Diego County are listed in **Table 1-2** below and illustrated in **Figure 1-3**.

Table 1-2 – Member agencies of the San Diego County Water Authority

Carlsbad Municipal Water District	Rainbow Municipal Water District
City of Del Mar	Ramona Municipal Water District
City of Escondido	Rincon del Diablo Municipal Water District
Fallbrook Public Utility District	City of San Diego
Helix Water District	San Dieguito Water District
Lakeside Water District	Santa Fe Irrigation District
National City (member of Sweetwater District)	South Bay Irrigation District (member or Sweetwater Authority)
City of Oceanside	Sweetwater Authority
Olivenhain Water District	Vallecitos Water District
Otay Water District	Valley Center Municipal Water District
Padre Dam Municipal District	Vista Irrigation District
Camp Pendleton Marine Corps Base	Yuima Municipal Water District
City of Poway	

1.5.2.3 City of Escondido

The City of Escondido (Escondido) was first incorporated as a city in 1888. Escondido's population as of 2006 was estimated at 140,766 by the State Department of Finance. The population in Escondido more than doubled between 1980 and 1990 (growth of 69%), and has continued to increase but at a slower rate between 1990 and 2000 (growth 23%).

Escondido's Public Utility/Water Division maintains two lakes (Dixon Lake and Lake Wohlford) and a recycled water distribution system. The goal of the Utilities Division/Water Division is to deliver high-quality water at the most economical cost. The two lakes provide raw water to the Escondido-Vista Water Treatment Plant facility which, in turn, supplies water to approximately 26,000 residents, commercial, and agricultural customers in Escondido. As listed above, Escondido is also a member agency of the SDCWA and thus primarily relies on imported water supplies from SDCWA. Escondido is located due west and northwest of the SPGMP area. Escondido also obtains groundwater supplies from the Upper San Luis Rey basin.

1.5.3 Other Stakeholders

The following section provides a description of stakeholders within the basin related to water including irrigation districts and land lessees.

1.5.3.1 Santa Fe Irrigation District and the San Dieguito Water District

Santa Fe Irrigation District (SFID) and the San Dieguito Water District (SDWD) (own a property right to local water yield in the Lake Hodges watershed). They are the only

agencies to beneficially use this drinking water source since the construction of the dam in 1918. The City of San Diego owns the dam and some of the water supplies associated with this source, but to date have not put the stored water in Lake Hodges to beneficial use. According to a 1998 agreement between the City, SFID and SDWD, 57.33 percent of the first 7,500 acre feet of water in Lake Hodges can be used by SFID and 42.67 percent can be used by SDWD. Any excess local water over 7,500 AFY will be split 50/50 between the two Districts. This agreement is subject to the conditions that:

1) The Districts request the water,

2) There is sufficient local water in Lake Hodges for the two Districts,

3) There will be at least 8,300 AF of storage in Lake Hodges available to the Districts for the remainder of the water contract year, and

4) The water will be put to beneficial use.

In 2008, the SDCWA is expected to complete the Lake Hodges Improvement Project, which will connect Olivenhain Reservoir to Lake Hodges with a pipeline and pump station. Once this project is complete, the base yield of 7,500 AFY will be reduced to 5,700 AFY available to the Districts; SFID will still be entitled to receive 57.33 percent and the SDWD will still be entitled to receive 42.67 percent of this water in any given contract year. This value is expected to remain the same through the year 2030.

1.5.3.2 Land Lessees

The City of San Diego owns the land and water rights in the illustrated regions of the basin (**Figure 1-2**), and is subject to providing reasonable amounts of water granted to various agricultural land lessees. Based on land use illustrated in this figure, the water use demands would be approximately 8,800 AF/yr for the entire basin. San Diego requires that leases follow best management practices to protect surface and groundwater quality in the basin. Examples of BMP's in recent leases include:

- Filter strips/temporary manure storage
- Pest management
- Grazing rotation
- Storm Water Pollution Plan of City, and

- Semi annual meetings with the City to review BMPs,

Exerpts from lease agreements that pertain to protection of the environment and groundwater quality are included in **Appendix A.**

1.6 ROLES OF STATE AND FEDERAL AGENCIES IN CALIFORNIA GROUNDWATER MANAGEMENT

This section describes the roles that State and federal agencies have in California groundwater management. Although the groundwater management plans are the local responsibility, State and federal agencies still have goals related to groundwater management that are focused on maintaining a reliable groundwater supply

1.6.1 California Department of Water Resources

California Department of Water Resources (DWR) role in groundwater management involves programs that directly benefit local groundwater management efforts. DWR's programs include roles such as assisting local agencies to assess basin characteristics and identify opportunities to develop additional water supply, monitoring groundwater levels and quality, and providing standards for well construction and destruction. DWR also has a Conjunctive Water Management Program which consists of developing integrated efforts to assist local agencies to improve groundwater management and increase water supply reliability. DWR Southern District has participated in the PAC meetings during the development of the SPGMP. Southern District has also assisted the City of San Diego in locating wells to be included in the groundwater monitoring program.

1.6.2 State Water Resources Control Board and Regional Water Quality Control Board

The missions of the State Water Resources Control Board (SWRCB) and the Regional Water Quality Control Board (RWQCB) are to ensure water quality in the state and to enforce water quality objectives and implement plans to protect beneficial uses of the State's waters. SWRCB's Groundwater Ambient Monitoring and Assessment (GAMA) program was developed to provide a comprehensive assessment of water quality in the state. The two main components of the Groundwater Ambient Monitoring and Assessment (GAMA) program are the California Aquifer Susceptibility (CAS) Assessment and the Voluntary Domestic Well Assessment Project. The SWRCB and RWQCB are involved in plans that include developing basin plans to identify beneficial

uses of marine water, groundwater, and surface waters. The San Diego RWQCB has been invited to participate in the PAC meetings during development of the SPGMP, but has declined. Groundwater quality objectives for San Pasqual Basin, described in Section 2, have been obtained from the San Diego RWQCB Basin Plan.

1.6.3 California Department of Public Health

The California Department of Public Health (DPH) provides oversight and inspects approximately 8,500 public water systems that are required to monitor drinking water quality under the federal Safe Drinking Water Act implemented by DHS. The public water operators are required to monitor 80 inorganic and organic contaminants and six radiological contaminants reflecting the natural environment. The public water operators are also required to monitor contaminants that impact the aesthetic properties of drinking water, which are known as the secondary MCLs. The water quality monitoring data from these analyses dating back to 1984 are stored in a database maintained by DHS.

1.6.4 California Department of Pesticide Regulation

The California Department of Pesticide Regulation (DPR) plays an important role in monitoring pesticides and in preventing further contamination of groundwater resources. DPR maintains a database that consists of pesticide sampling in groundwater and reports a summary of annual sampling and detections to the State Legislature.

1.6.5 California Department of Toxic Substances Control

The California Department of Toxic Substance Control (DTSC) is responsible for two programs that relate to the protection of groundwater resources. The two programs consist of elements focused on maintaining environmental quality and economic vitality by protecting the groundwater resources. If groundwater is threatened or impacted in a basin, DTSC provides oversight of the characterization and remediation of the soil and groundwater contamination. The DTSC coordinates with the RWQCB to ensure that groundwater quality objectives are met according to site-specific groundwater basin plans.

1.6.6 U. S. Geological Survey

The U. S. Geological Survey (USGS) has an active role in California groundwater basin studies and maintains an extensive database consisting of groundwater level and

groundwater quality monitoring data. The USGS participated in public meetings held during the development of the SPGMP.

1.6.7 County of San Diego Department of Environmental Health

The County of San Diego Department of Environmental Health (DEH) regulates the design, constructions, modification and destructions of water wells throughout San Diego a county to protect groundwater resources.

1.7 EXISTING GROUNDWATER MANAGEMENT PLANS

According to the most recent information available from the California Department Water Resources (DWR, 2004), the following districts/watersheds, in the vicinity of San Diego, have adopted GMPs: the Borrego Water District, the San Luis Rey Municipal Water District, the Sweetwater Authority, and the Rainbow Valley Basin Groundwater Management Plan. A summary description of each of these GMPs is provided in **Appendix B**.

1.8 OTHER WATER MANAGEMENT EFFORTS

The City of San Diego and adjacent water purveyors in the region have invested substantial time and resources in a series of regional planning efforts. The planning efforts were established in order to address challenges such as extended drought and wet periods and on-going and potential impacts to surface water quality and groundwater quality. In particular, the planning efforts most directly related to the San Pasqual Valley/City of San Diego efforts include:

- Rancho Bernardo Reclaimed Water Facilities Plan and San Pasqual Valley Groundwater Management Concepts, 1993
- San Pasqual Water Resources Strategic Plan Draft, 1994
- San Pasqual Valley Water Resources Management Plan, 1997
- San Diego County Water Authority's Groundwater Report, 1997
- San Diego County Water Authority's San Diego Formation Groundwater Storage and Recovery Feasibility Study: Phase 1, 1999

- San Diego County Water Authority's Lower San Luis Rey River Valley Groundwater Storage and Recovery Feasibility Study: Phase 1, 1999
- San Diego County Water Authority's Regional Water Facilities Master Plan, 2003
- San Diego County's Groundwater Ordinances Numbers 7994 (N.S.) and 9644 (N.S.)
- San Diego County Water Authority's 2005 Urban Water Management Plan (UWMP)
- City of Escondido's 2005 UWMP
- San Diego's LRWRP, 2006
- San Diego's Integrated Regional Water Management Plan (IRWMP), 2006
- San Diego's (Updated) Strategic Business Plan, 2006

A summary description of each of these water management is provided in **Appendix C**.

1.9 AUTHORITY TO PREPARE AND IMPLEMENT THE SPGMP

The authority of the City of San Diego to manage the SPGMP is based on City Council Policy. The City elected the SPGMP as one of the tools to effectively protect and manage the San Pasqual Valley basin, consistent with the City's San Pasqual Vision Plan and CWC §10755.2. On June 27, 2005 the City Council adopted the San Pasqual Vision Plan Council Policy 600-45 (included in **Appendix D**) to comprehensively protect the water, agricultural, biological and cultural resources within the San Pasqual Valley. The GMP is a required element of the policy.

In 1992, the California Legislature passed Assembly Bill (AB) 3030, which was designed to provide local public agencies increased management authority over their groundwater resources. In September 2002, new legislation, Senate Bill 1938 (SB 1938) expanded AB 3030 by requiring groundwater management plans to include certain specific components in order to be eligible for grant funding for various types of groundwater related projects.

Recently, there has been an emphasis by the State for agencies to develop integrated regional solutions for water management solutions (SB 1672), and coordinating the

conjunctive management of surface and ground water to improve regional water supply reliability and water quality.

1.10 SPGMP COMPONENTS

The California Department of Water Resources and the California Water Code provide a summary of Groundwater Management Plan components. The SPGMP includes required and voluntary components as listed in the California Water Code (CWC) § 10750 and DWR recommended components. Each of these components is addressed within the SPGMP. **Table 1-3** lists these components and indicates the section(s) in which each is addressed.

Table 1-3 – Location of SPGMP Components

Description	Section(s)
A. CWC § 10750 *et seq.*, Required Components[1]	
1. Documentation of public involvement statement.	3.4.1
2. Basin Management Objectives (BMOs).	3.2
3. Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	3.5
4. Plan to involve other agencies located within groundwater basin.	3.4
5. Adoption of monitoring protocols by basin stakeholders.	3.5
6. Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118.	1.3
7. For agencies not overlying groundwater basins, prepare GMP using appropriate geologic and hydrogeologic principles.	Not Applicable
B. DWR's Recommended Components[2]	
1. Manage with guidance of advisory committee.	3.4
2. Describe area to be managed under GMP.	1.3
3. Create link between BMOs and goals and actions of GMP.	3.0
4. Describe GMP monitoring program.	3.5
5. Describe integrated water management planning efforts.	3.8
6. Report on implementation of GMP.	4.1
7. Evaluate GMP periodically.	4.2
C. CWC § 10750 *et seq.*, Voluntary Components[3]	
1. Control of saline water intrusion.	3.6
2. Identification and management of wellhead protection areas and recharge areas.	3.6
3. Regulation of the migration of contaminated groundwater.	3.6
4. Administration of well abandonment and well destruction program.	3.6
5. Mitigation of conditions of overdraft.	3.2, 3.7
6. Replenishment of groundwater extracted by water producers.	3.7
7. Monitoring of groundwater levels and storage.	3.5
8. Facilitating conjunctive use operations.	3.7
9. Identification of well construction policies.	3.6
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects.	3.6
11. Development of relationships with state and federal regulatory agencies.	3.4
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	3.4

1. CWC § 10750 *et seq.* (seven required components). Recent amendments to the CWC § 10750 *et seq.* require GMPs to include several components to be eligible for the award of funds administered by DWR for the construction of groundwater projects or groundwater quality projects. These amendments to the CWC were included in Senate Bill 1938, effective January 1, 2003.
2. DWR Bulletin 118 (2003) components (seven recommended components).
3. CWC § 10750 *et seq.* (12 voluntary components). CWC § 10750 *et seq.* includes 12 specific technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions

Addressing each of these componenets in the groundwater management plan demonstrates to the State, that the local groundwater basin management authority has a plan to protect the groundwater resource in a sustainable method for the benefit of current and future interests in the basin. Once adopted by the City of San Diego, the SPGMP will be evaluated and scored by the DWR at the time that San Diego applies for grant funds from current (Proposition 50, 84, 1e and the AB303) and future state grant programs. San Diego anticipates receiving funds from these grant programs to help finance groundwater improvement projects in the basin. San Diego's potential to receive

grant funds under theses program is diminished if San Diego were not to adopt the SPGMP or if the components in the **Table 1-3** are missing from the GMP.

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Section 2 – Water Resources Setting

This section describes the water resource setting including the current understanding of the surface and subsurface features of the San Pasqual Valley Groundwater basin (basin). This section also includes a description of the groundwater and surface water supplies in the basin. Information for this section was obtained from on going monitoring efforts and results of previous studies, and represents the best available information. The charts and figures included in this section illustrate the type of information of interest and period of record for understanding the groundwater conditions within the basin. Instances where the data record appears incomplete, inconsistent or missing altogether are noted in this section and these examples are used to underscore the need for improved monitoring within the basin to collect necessary information for improved groundwater management decisions. Additional field data collection and analysis during the GMP development period was beyond the scope of the project. However, action items focused on improved field data collection and archival are presented in Section 3 of this GMP. These action items will go into effect when the GMP is adopted by the San Diego City Council.

2.1 ENVIRONMENTAL SETTING

As described in Section 1, the basin is located within San Diego County as illustrated in **Figure 1-1** and within the central portion of the San Dieguito Watershed, illustrated in **Figure 2-1.** The basin has a Mediterranean-type climate with annual mean daily temperatures ranging between 46.3 and 76.0 degrees Fahrenheit (Metcalf and Eddy, 1997). The estimated average annual rainfall across the San Dieguito Watershed is approximately 19.7 inches. However, the mean annual precipitation within the basin is between approximately 13 and 14 inches (Weston Solutions, 2006).

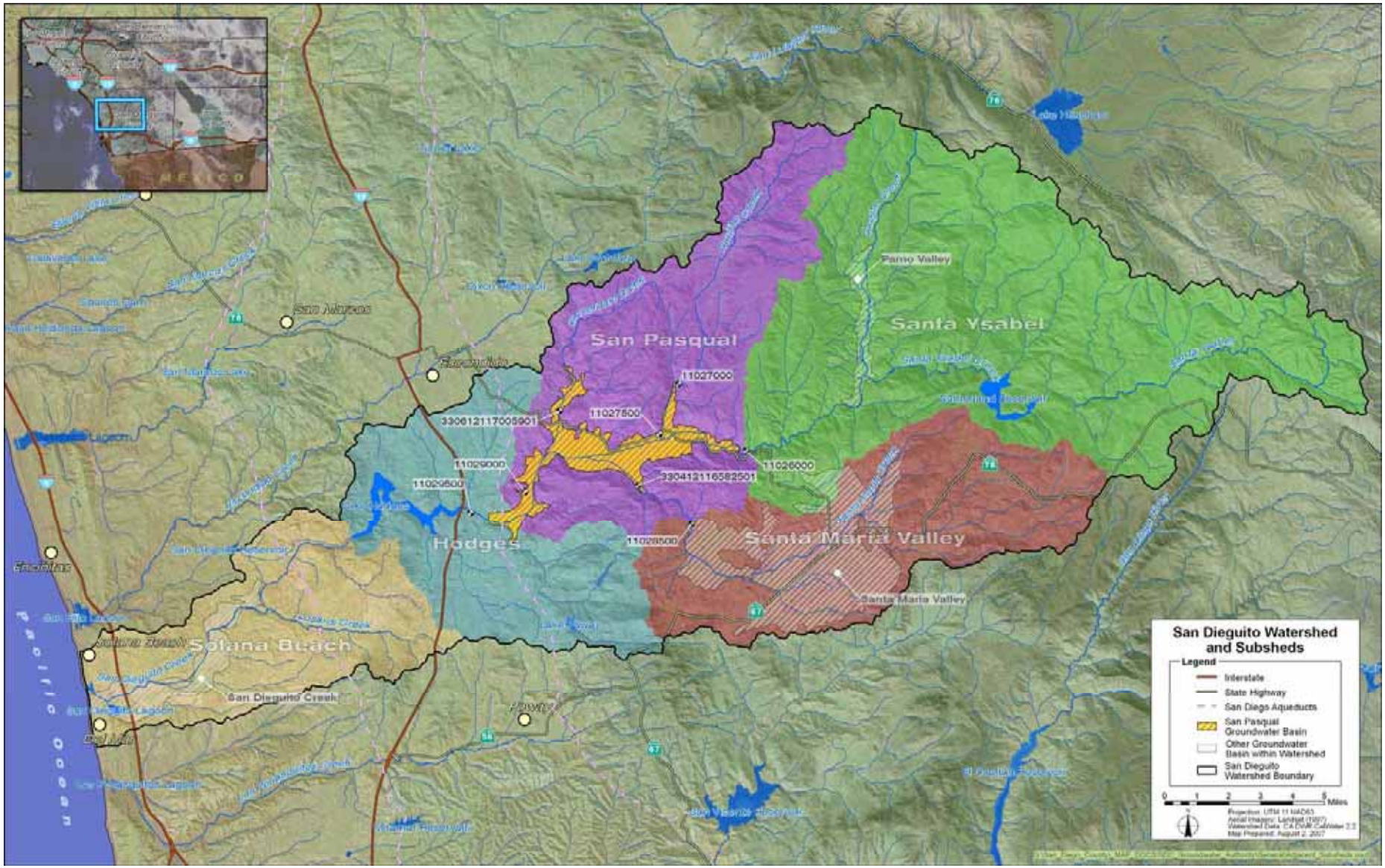

Figure 2-1 - San Dieguito Watershed and Subsheds Within and/or Surrounding the SPGMP area.

The biological resources within the San Pasqual Valley consist of numerous sensitive native vegetation types and non-native vegetative communities, which are described in detail in the San Dieguito Watershed Management Plan (SDWMP) (Weston Solutions, 2006). The San Pasqual Valley is home to over 150 wildlife and 150 plant species, several of which are endangered and/or threatened, including the arroyo toad, coastal California gnatcatcher, least Bell's vireo, and southwestern willow flycatcher (Weston Solutions, 2006). The SDWMP contains a comprehensive list of all endangered, threatened, and special concern species living in the San Pasqual Valley. During the implementation of the SPGMP monitoring plans will give special consideration to protecting these sensitive biological resources.

San Diego owns the majority of the land within the alluvial valley floor of the basin, illustrated in Figure 1-2. The land owned by the San Diego is leased to a variety of tenants for primarily agricultural-residential (AG-RES) and agriculture (AG) uses. Within the basin, AG-RES and AG water demand is met almost solely from groundwater. Outside of the basin, the City is reliant predominantly on local surface and imported water supplies to meet their consumptive use needs. In more recent years, the City has begun water planning efforts involving conjunctive use projects to meet projected future groundwater demands.

2.2 GROUNDWATER CONDITIONS

This subsection provides a description of general groundwater conditions including the groundwater basin, the geology/hydrogeology, groundwater elevation, and groundwater quality within the SPGMP area. The groundwater conditions of the basin have been investigated in a limited number of studies (DWR, 1993; Izbicki, 1983, Greeley and Hansen, 1993, CH2MHill, 2001).

The water quality, groundwater elevation, lithology, and well construction information discussed in this document have been used to populate a Data Management System (DMS). The DMS can be used to support the SPGMP and future conjunctive use opportunities as a tool to easily store, view, retrieve, and present the data from the region.

2.2.1 Groundwater Basin

The basin lies within the San Dieguito Watershed and is bounded by Lake Hodges to the southwest and by nonwater-bearing rocks of the Peninsular Ranges to the northeast

(DWR, 1959 and 2003; Izbicki, 1983). **Figure 1-2**[2] shows the land owned by the San Diego and the basin boundary from DWR Bulletin 118 (2003). Bulletin 118 provides additional information about the basin on the agency's website [3] including:

- Surface Area: 4,540 acres.
- The Santa Ysabel and Guejito Creeks drain the highlands of the neighboring watersheds and converge with Santa Maria Creek to form the San Dieguito River, which then flows out of the basin and into Lake Hodges.
- The average annual precipitation within the basin ranges from 11 to 15 inches.

2.2.2 Geology/Hydrogeology

The geology of the basin was mapped by the California Department of Water Resources (DWR 1967), and was later described by the USGS (Izbicki, 1983). The western portion of the basin was mapped in greater detail by the Department of Conservation, Division of Mines and Geology (1999) geologic map of the Escondido 7.5' Quadrangle San Diego, California which is available electronically in a digital database, courtesy of the Southern California Area Mapping Project. However, a geologic map of the eastern portion of the basin within the San Pasqual 7.5' Quadrangle San Diego, California is not currently available (USGS website: National Geologic Maps Database). Therefore, a completed detailed geologic map of the entire basin is unavailable. The fault activity map of California and adjacent areas from the Department of Conservation (Jennings, 1994) indicates that there are no active faults that cut through the basin. The nearest fault zone, the Whittier-Elsinore Fault, traverses the eastern end of the San Dieguito Watershed (Weston Solutions, 2006; Jennings, 1994).

2.2.2.1 Hydrostratigraphy

The San Pasqual Valley basin (DWR basin 9-10, 2003) is located within the San Pasqual hydrologic subarea, which is a 31 mi^2 region located within the San Dieguito River basin. The hydrologic subarea is located east of both the San Dieguito and San Elijo hydrologic

[2] **Figure 1-2** includes the DWR basin boundary overlaying aerial photographs of the basin and adjacent areas. In preparation of this figure, and analysis of the DWR basin boundary, MWH recognized that boundary did not accurately overly the alluvial groundwater bearing portions of the basin. MWH contacted DWR who validated the inaccuracy. For this reason, the basin boundary presented on this figure was originally prepared by DWR but further modified by MWH and is considered more accurate but still approximated.

[3] Source: http://www.dpla2.water.ca.gov/publications/groundwater/bulletin118/basins/pdfs_desc/9-10.pdf

subareas. Izbicki (1983) identified several geologic water-bearing units which make up the local aquifers in the San Pasqual hydrologic subarea. These units include Cretaceous age Granodiorites, Green Valley Tonalites, and deeply weathered Green Valley Tonalites, and Quaternary Alluvium.

The Cretaceous age granodiorites cover approximately 50 percent of the subarea or approximately 15.5 mi^2. These rocks form the hills and ridgetops in the subarea surrounding the San Pasqual Valley basin. They are quite resistant to weathering, although they may be weathered to a shallow depth in some areas. The granodiorites of the subarea typically contain tonalite, which is light-colored and ranges from fine-grained to coarse-grained.

The Green Valley Tonalite is exposed across approximately 30 percent of the subarea or approximately 9.3 mi^2 and is less resistant to erosion. The Green Valley Tonalite in the subarea can be deeply weathered and form residuum (also referred to as decomposed granite (DG)). The residuum is exposed across approximately 1,550 acres or 8 percent of the subarea surrounding the San Pasqual Valley basin, making up the lowlands and hilly topography in the vicinity of faults in the region. The Green Valley Tonalite is described as medium-grained gray tonalite with minor granodiorite, gabbro, and other igneous rocks.

The Alluvium stretches across 3,410 acres or approximately 15 percent of the subarea and nearly 100 percent of the San Pasqual Valley basin. Alluvial thickness in the basin ranges between 120 feet in the San Pasqual Narrows (region extending from the uppermost influence with Lake Hodges to the confluence of Cloverdale Creek) and increases to over 200 feet in the upper part of the basin. The alluvium is described as non-active Holocene age alluvial flood plain, colluvial (unconsolidated slope wash sediments), and stream deposits. The unconsolidated sediments range from silty sand with clay to silty sand with clay and gravel. The Alluvium was derived from erosion of the surrounding crystalline rocks. The Alluvium forms a generally unconfined aquifer in the hydrologic subarea, which may be locally confined by clay and silty sand.

The water-bearing units which make up the local aquifer in the San Pasqual Valley basin are the Quaternary Alluvium and the deeply weathered Green Valley Tonalites (or residuum). Previous reports have shown that the alluvial aquifer within the San Pasqual groundwater basin ranges between 120 and 200 feet in thickness and extends laterally to the surrounding foothills (Izbicki, 1983). The USGS reported well yields within the

alluvium to be as high as 1,600 gpm (Izbicki, 1983). The transmissivity of the alluvial aquifer within the San Pasqual basin was estimated by the USGS to be less than 25,000 ft^2/day. However, a small portion of the aquifer which extends along the Santa Ysabel River is believed to have a transmissivity greater than 25,000 ft^2/day. **Figure 2-2** illustrates a geologic cross section of the alluvial aquifer along a line of section shown on **Figure 2-3**. The cross section illustrates the subsurface geology from east to west across the basin.

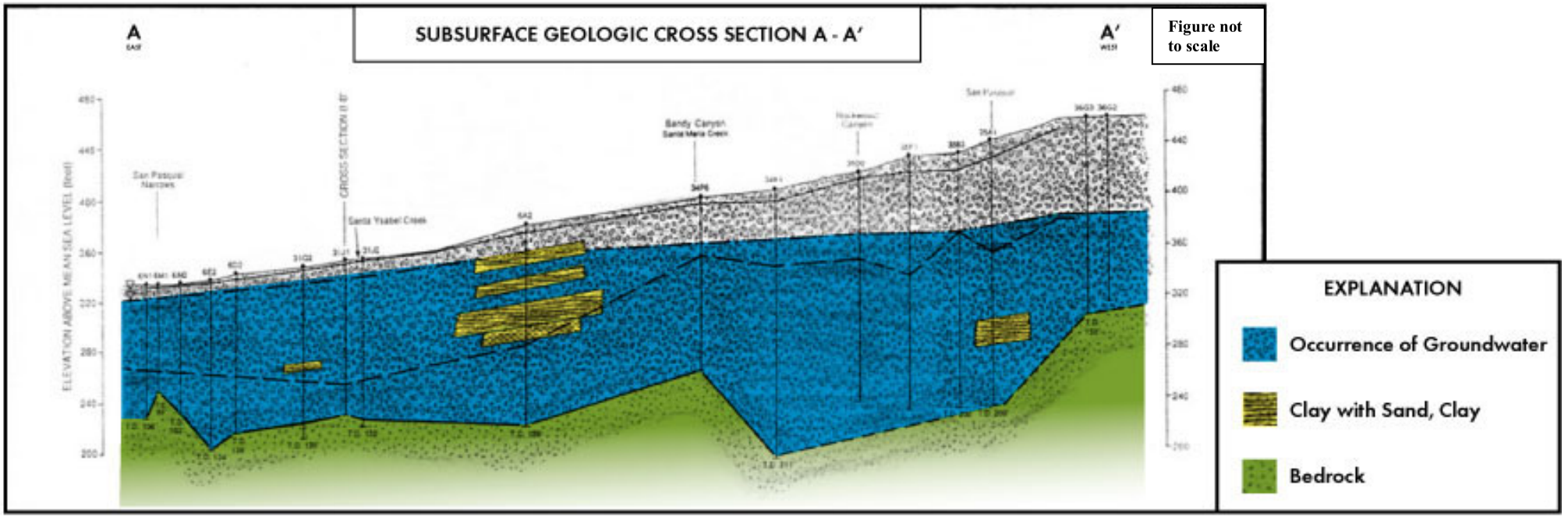

Figure 2-2 - Subsurface geology from A to A' (modified from Greeley and Hansen, 1991, courtesy of Ken Schmidt and Associates).

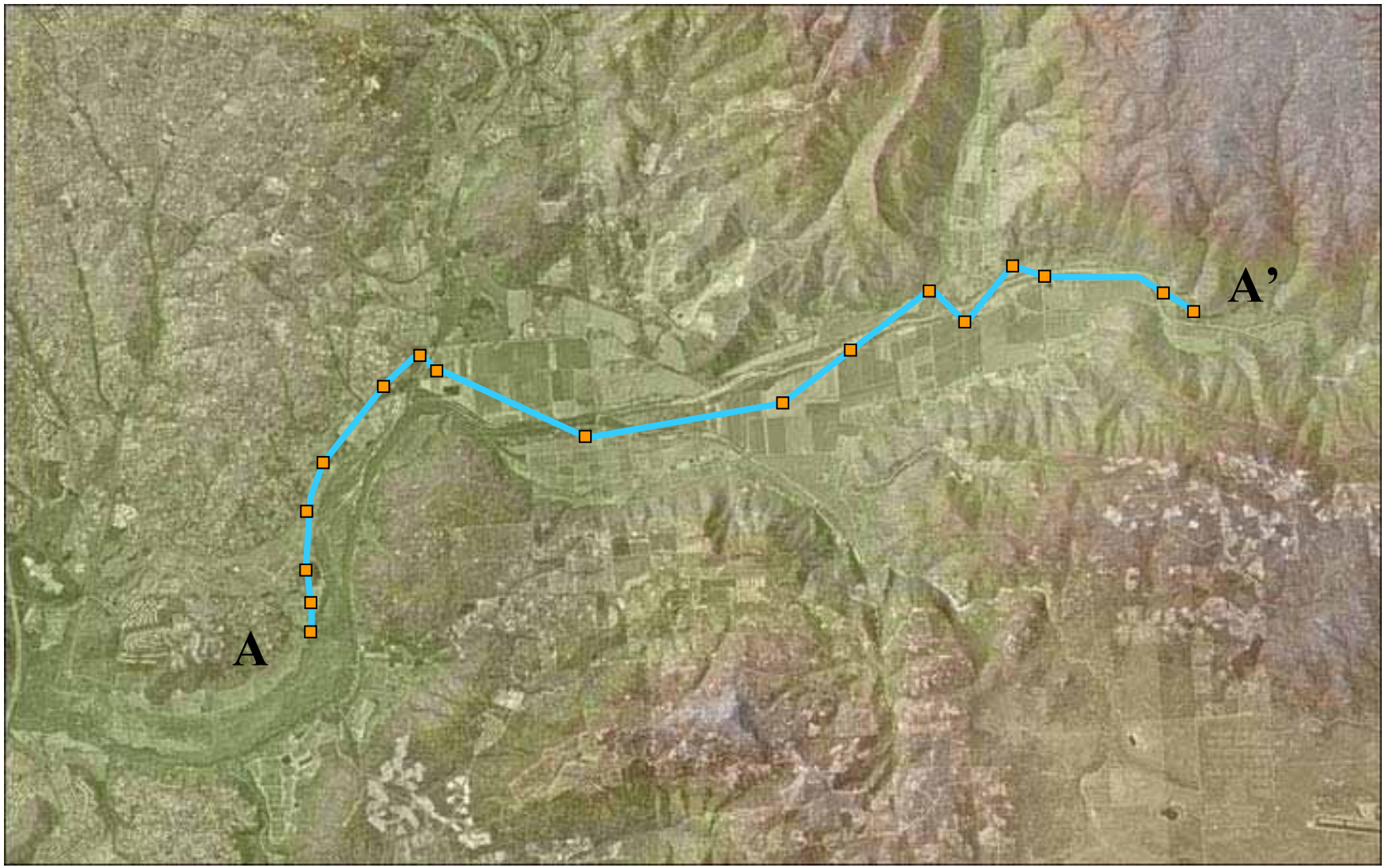

Figure 2-3 - The cross section well locations from A to A’.

The cross section shown on **Figure 2-2** illustrates the hydrostratigraphy of the basin and the shallowest and deepest groundwater elevations recorded in the identified wells between 1977 and 1990. The shallowest groundwater elevations are marked by a straight line that is close to the ground surface. The deepest measurements recorded in 1977 and 1990 are shown by a dashed line and a dash-double dot line. The units described as having the occurrence of groundwater were sand, sand and gravel, and gravel. Clay with sand or clay was identified in a few of the wells, indicated the presence of some non-continuous locally confining units. The total depth (T.D.) of each well to bedrock is also indicated on the cross section. The cross section indicates that the aquifer ranges between approximately 120 ft and 200 ft thick within the basin.

2.2.2.2 Recharge and Extraction of Groundwater

Evaluating the changes in aquifer conditions requires an understanding of the dynamic processes and interactions that are taking place as extractions and recharge of the aquifer occur. Conceptual models of the aquifer that describe recharge, aquifer storage, and differences between localized and regional effects on the aquifer are discussed below.

Recharge: Groundwater in the basin moves from sources of recharge to points of discharge.

The primary source of recharge to the alluvial aquifer within the basin originates from outside of the basin as streamflow of the Santa Ysabel, Guejito, Santa Maria, and Cloverdale Creeks (**Figure 2-1**). These creeks flow through the valley and leave the hydrologic subarea as the San Dieguito River at San Pasqual Narrows (Izbicki, 1983). Stream gauge stations exist for the Santa Ysabel, Guejito, and Santa Maria Creeks and average annual flow estimates for these creeks can be estimated. Stream gauge stations exist; and average annual flow estimates for these creeks can be estimated. No average annual flow estimates are available for the ungauged Cloverdale Creek. Izbicki (1983) stated that in a typical year, no flow from the ephemeral streams leaves the basin, and all of the surface water that is not lost to evapotranspiration becomes recharge to the alluvial aquifer. However, this statement can not be verified using gauge data because the stream gauge stations along the San Dieguito River at the outlet of the San Pasqual Valley basin have been abandoned since 1965.

The areas of recharge extend along the ephemeral stream and river channels where coarse alluvial sediments exist. A small source of recharge comes from precipitation,

streamflow that originates within the basin, and leakage from the residual aquifer. The remainder of the recharge to the alluvial aquifer comes from irrigation return water from both native groundwater and imported water.

Changes in the groundwater elevation result from changes in groundwater recharge, discharge, or extraction.

Extraction: A cone of depression develops when groundwater is extracted from a single well. Extraction of groundwater within the SPGMP area was estimated to be approximately 6,000 AF/yr in 1970. From 1980 to 2000, a steady rate of groundwater pumping was estimated at 6,300 AF/yr (CH2MHill, 2001). There is no indication from groundwater level data in 1995 (**Figure 2-4**) that extraction within the alluvial aquifer in the SPGMP area has resulted in a regional cone of depression. A groundwater elevation monitoring plan will address what actions are necessary if a regional cone of depression develops.

2.2.2.3 Groundwater Elevations

Provided within the following subsection is a description of groundwater elevation contours in 1995 and hydrographs from select wells.

Groundwater Elevation Contours. The average groundwater elevation contours for the basin for the period between 2/7/95 and 2/7/96, based on data from eight wells is illustrated on **Figure 2-4**. Generally, groundwater is deeper on the eastern edge of the basin near the Santa Ysabel Creek and Santa Maria Creek and shallower on the western edge near Lake Hodges. Over this distance of 7.1 miles, the 1995 groundwater elevation difference from the eastern portion to the western portion of the basin was approximately 96 feet. Therefore the average groundwater gradient across the entire basin during 1995 was 0.003 toward the west.

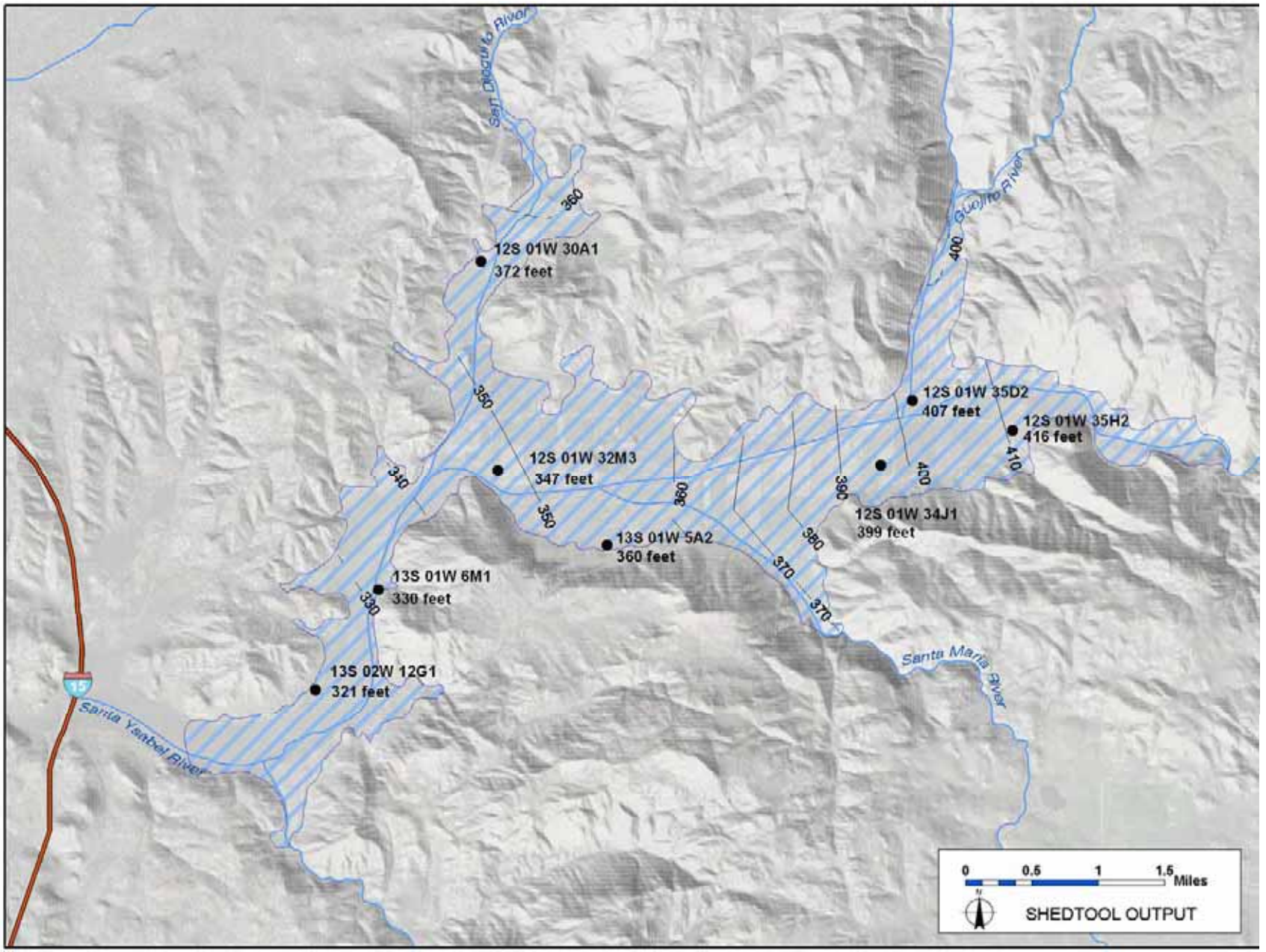

Figure 2-4 - Average Groundwater Elevations for select wells for the period between 2/7/95 and 2/7/96

Groundwater Elevation Hydrographs. Early records from wells indicate that groundwater was very near the land surface in the early 1900s and gradually began to decline in the 1940s and 1950s (Izbicki, 1983). Hydrographs for eight representative wells in the basin are shown on **Figure 2-5**, for the period between 1971 and 1995 for five wells; and between 1971 and 2000 for the three remaining wells. These hydrographs indicate that the groundwater elevations within the basin started to recover to baseline elevations after 1977 through the early 1980s. However, several of the monitoring wells then experienced another decline in the early 1990s potentially in response to a dry period or increased pumping. The hydrographs show that in general:

- Groundwater is shallow in the western area,
- Groundwater levels in the west are steady regardless of hydrologic year type,
- The drought in the late 1970s resulted in groundwater decline throughout the basin.
- Groundwater is relatively deep in the eastern area of the basin, and
- The eastern portion of the basin shows the greatest variability in groundwater levels in response to pumping and hydrologic year type.

Four wells, from the eastern, northern, central, and western regions of the basin are described in more detail below.

State well number 13S/02W-12G1 is the western-most well with groundwater elevation data shown in **Figure 2-5**. Groundwater elevations for this well extended to nearly 10 feet below the ground surface in the early 1970s. In 1977, the groundwater elevations reached a depth approximately 20 feet below the ground surface, but quickly rebounded to a very shallow depth, approximately 1.5 feet below the ground surface following a series of wet years. From 1980 to the present, the groundwater elevations at this well have fluctuated with the seasons, but have remained very near the ground surface. Spring groundwater elevations are typically one to three feet higher than during the fall season. This could indicate that the basin is replenished in the winter by rainfall and less intensive pumping from agricultural activities. This could also indicate that a prolonged dry season and extensive pumping during the summer reduces groundwater storage and lowers groundwater elevations.

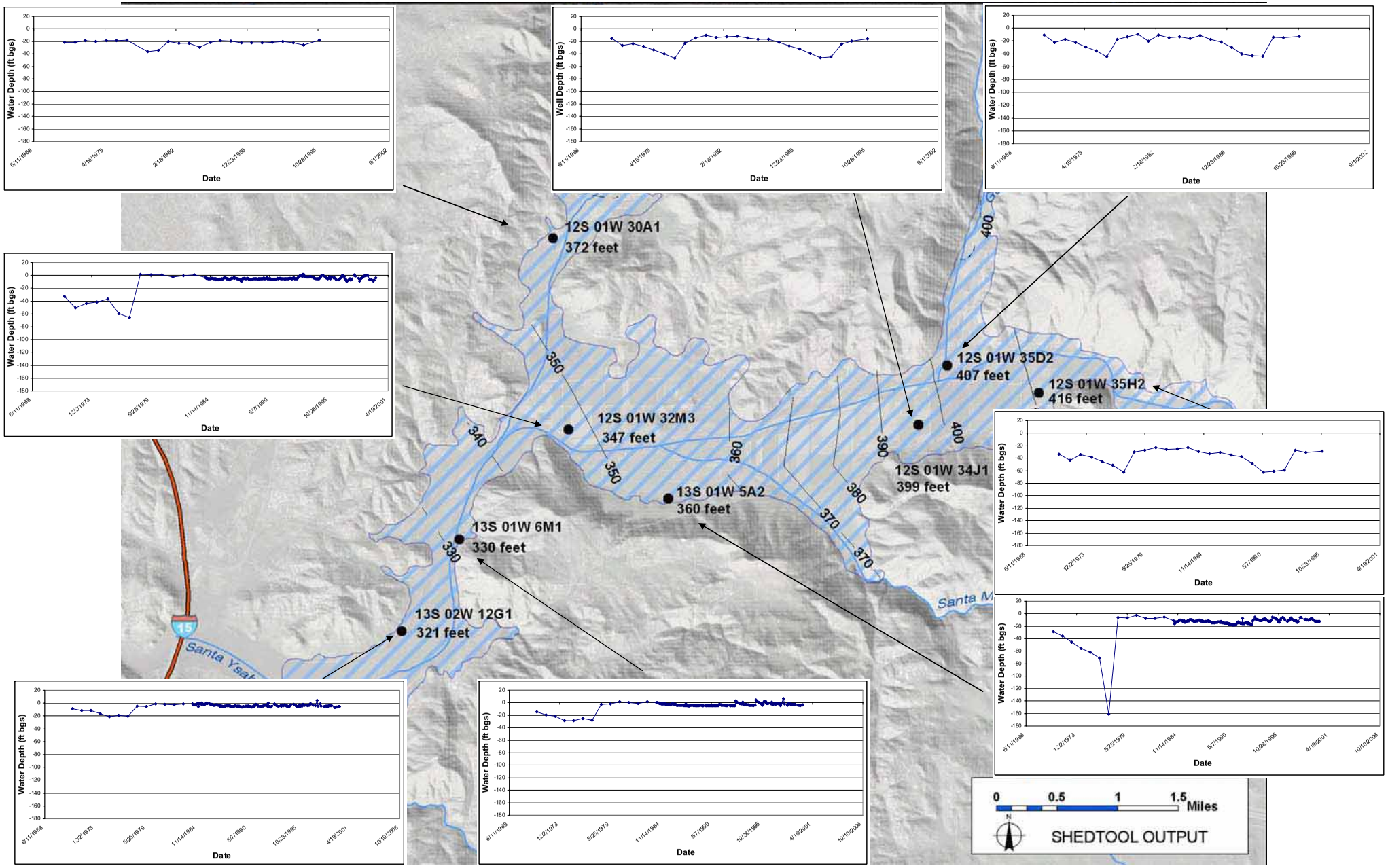

Figure 2-5 – San Pasqual Valley Groundwater Basin-Groundwater Elevation Hydrographs

[1]The 6/1/1977 data point for well 13S01W6M1 appears to be anomalous or inconsistent with data collected before and after 1978 and may be the result of an error in field data collection or achieving.

State well number 12S/01W-30A1 is located in the central area along Cloverdale Creek as shown in **Figure 2-5**. Groundwater elevations for this well extended to a depth of slightly greater than 20 feet below the ground surface for the most of the period of record, between 1971 and 1995. Unlike other wells in the basin, the groundwater elevations did not exhibit the same drop in 1977, the driest year on record, but instead showed the drop in groundwater elevation in 1979 (no measurement was recorded in 1978). The seasonal fluctuations in the groundwater elevations are unknown because monitoring reports are only available on an annual basis.

State well number 13S/01W-5A2 is located in the center of the basin shown in **Figure 2-5**. Groundwater elevations for this well experienced significant declines, which could be attributed to measurement error or the presence of confining units above the screened interval of the well. **Figure 2-2** illustrates a modified cross section from Greeley and Hansen (1991) courtesy of Ken Schmidt and Associates, passing through state well number 13S/01W-5A2. The geologic log for this well shows the potential for confining layers of clay with sand, and silt, which extend horizontally, but pinch out before intersecting the next easternmost and westernmost wells in the cross section. The well log report does not contain screen interval information, which prevents a conclusive statement that the well is confined. The decline of groundwater elevations in this well could be due to pumping, which would show a more dramatic decline when pumping in a confined aquifer, but would recover to pre-extraction conditions quickly after pumping ceases. The groundwater elevation in state well number 13S/01W-5A2 recovered to a shallower depth than the elevations experienced prior to 1977, which could indicate that this well was no longer used for pumping after 1977. Seasonal fluctuations in the groundwater elevations are unknown prior to June 1984, because monitoring reports are only available on an annual basis. The record of groundwater elevations after 1984 until approximately 1993 indicates that spring groundwater elevations were typically one to three feet higher than during the fall season. After 1993, there was a shift in the groundwater elevation baseline condition to a shallower depth, and the spring groundwater elevations were typically three to six feet higher than during the fall season.

State well number 12S01W35H2 is the eastern-most well with groundwater elevation data shown on **Figure 2-5**. Groundwater elevations for this well exhibit annual fluctuations which loosely reflect the annual precipitation record (CH2MHill, 2001[4]). The seasonal fluctuations in the groundwater elevations are unknown because monitoring reports are only available on an annual basis. The depth to groundwater during the period of record has fluctuated between 20 and 60 feet below ground surface (bgs).

2.2.3 Groundwater Quality

Groundwater quality data within the SPGMP area has been collected and reported for a period between 1950 to the present by various sources including the City of San Diego, DWR, SDCWA, USGS, and Metcalf and Eddy. This section provides a summary of the groundwater quality results and brief descriptions of constituents of interest.

The identified sources of potential contamination within the SPGMP area have been discussed and presented in the SDWMP (Weston Solutions, 2006) and include recreation, urban and industrial runoff, animal grazing, concentrated animal facilities, agriculture, wastewater discharges, septic systems, sewage spills, fires, and solid and hazardous waste. The potential water quality issues and concerns associated with the potential contamination include the following:

- Nutrients/eutrophication/oxygen depletion
- Silt and sediment
- Toxicity
- Pathogens in water
- Salinity and dissolved solids, and
- Litter/trash/debris.

Best management practice (BMPs) were developed in the SDWMP to address these potential water quality issues and concerns, (Weston Solutions, 2006).

[4] CH2MHill presented a figure with a histogram of annual precipitation, based upon the combined observed data for NOAA cooperative stations #42862 and #42863. The figure illustrated the annual precipitation for the period between 1931 and 1999 for the the Escondido Composite Station.

The DWR described groundwater quality in the San Pasqual Groundwater Basin as having a mixed character (DWR, 2003). Izbicki (1983) reported that groundwater in the eastern portion of the basin had a more dominant calcium bicarbonate character, which meant that the hardness of the water within this portion of the basin was high. Izbicki (1983) also found that the hardness of the water in the western portion of the basin was not as significant, but had a more dominant sodium chloride character with sulfate as the minor anion indicating the presence of more saline water. However, greater than 70% of the groundwater quality data used in this evaluation was collected after Izbicki's 1983 report and indicates that the hardness of the water in the western portion of the basin was greater than in the eastern portion of the basin. The concentration of salts in the western portion of the basin has been attributed to irrigation return water and imported water use which is high in salts and is prevalent in the hillside areas (SDCWA, 1983). The mixed character of groundwater in the basin was observed not only in anion and cation concentrations but also in other constituents. Groundwater quality from wells throughout the basin has been tabulated as shown in **Table 2-1**.

Table 2-1 presents a comparison of groundwater quality data with applicable California drinking water quality standards (both primary and secondary (aesthetic) maximum contaminant levels (MCLs)). Primary MCLs are derived from health-based criteria which include technologic and economic considerations. Primary MCLs are legally enforceable standards that apply to public water systems designed to protect the public health by limiting the levels of contaminants in drinking water. Secondary MCLs are designed to regulate contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. In California, public water systems are required to comply with the secondary MCLs.

Table 2-1 also presents the groundwater quality objectives of the Regional Water Quality Control Board (RWQCB) for the San Pasqual region within the San Dieguito Hydrologic Unit.

Both MCLs and RWQCB objective are used as a point of reference because groundwater has to be treated to meet MCLs before it can be used as a public drinking water supply. RWQCB objectives are of interest because groundwater in the basin cannot be degraded beyond these objectives by any activity at the surface, be it agriculture, urbanization, groundwater recharge, etc.

As shown on **Table 2-1** and described below, TDS and nitrate and other constituents of interest including Aluminum, iron, manganese, chloride, sulfate, cadmium, fluoride, selenium and zinc are present and have exceeded their respective MCLs in wells the basin.

The following description of background groundwater quality is based on known, available data used to populate the Data Management System (DMS) from 48 wells between 1950 and 2006. It is possible that additional unknown groundwater quality data exists from wells in the basin. The DMS can be used to query data and develop statistics and graphics for the constituents included in this evaluation.

Table 2-1 - Water Quality Summary from period of record (1950 to 2006)

Constituent	Primary MCL [8]	Secondary MCL [8]	RWQCB Groundwater Quality Objectives [3]	Units	Results						Exceeds Primary or Secondary MCL [1]	Exceeds RWQCB Groundwater Quality Objective [1]
					Western Portion of Basin			Eastern Portion of Basin				
					max	min	ave [7]	max	min	ave [7]		
General Mineral												
Calcium	--	--	--	mg/L	352	11	140	274	21	85	NA[2]	NA[2]
Chloride	--	250/500/600 [6]	400 [4]	mg/L	1,618	72	270	324	0.3	100	Yes	Yes
Fluoride	2	--	1.0 [4]	mg/L	2	< 0.03	0.5	62.1	< 0.03	0.6	Yes	Yes
Hardness (as CaCo3)	--	--	--	mg/L	1,390	50	500	997	127	347	NA[2]	NA[2]
Magnesium	--	--	--	mg/L	170	< 3	60	121	4.6	35	NA[2]	NA[2]
Nitrate (as NO3)	45	--	10 [4]	mg/L	174	<0.2	40	141.5	<0.2	20	Yes	Yes
Potassium	--	--	--	mg/L	28	0.604	3.5	12	<0.5	3	NA[2]	NA[2]
Sodium	--	--	--	mg/L	540	3.11	185	204	34	83	NA[2]	NA[2]
Sodium Percent	--	--	60 [5]	%	42%	19%	40%	27%	51%	33%	NA[2]	No
Sulfate	250	250/500/600 [6]	500 [4]	mg/L	1,063	3.9	310	519	10	100	Yes	Yes
Alkalinity (total)	--	--	--	mg/L	408	89.2	270	384	20	200	NA[2]	NA[2]
General Physical												
Total Dissolved Solids	500	500/1000/1500 [6]	1000 [4]	mg/L	3060	58	1300	4400	262	722	Yes	Yes
Inorganics												
Aluminum	1	0.2	--	mg/L	0.387	0.00205	0.0179	0.27	0.00136	0.0184	Yes	NA[2]
Antimony	0.006	--	--	mg/L	0.00587	0.00145	0.0039	<0.0005	<0.0005	<0.0005	No	NA[2]
Arsenic	0.01	--	--	mg/L	0.009	0.00102	0.0030	0.007	0.00075	0.0024	No	NA[2]
Barium	2	--	--	mg/L	0.135	0.00131	0.0576	0.294	0.00239	0.1280	No	NA[2]
Beryllium	0.004	--	--	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	No	NA[2]
Boron	--	--	0.75 [4]	mg/L	0.194	<0.0005	0.060	0.148	<0.0005	0.0400	NA[2]	No
Cadmium	0.005	--	--	mg/L	0.02	0.00115	0.004	0.003	0.00108	0.0030	Yes	NA[2]
Chromium	0.05	--	--	mg/L	0.0114	0.00101	0.004	0.0105	0.00101	0.0034	No	NA[2]
Copper	--	1	--	mg/L	0.05	0.00133	0.007	0.351	0.00101	0.0101	No	NA[2]
Iron	--	0.3	0.3 [4]	mg/L	35.6	0.0266	2.060	4	0.01	0.3000	Yes	Yes
Lead	0.015	--	--	mg/L	0.05	0.000561	0.021	0.05	0.000844	0.0180	No	NA[2]
Manganese	--	0.05	0.05 [4]	mg/L	2.7	0.0002	0.300	5.67	0.0002	0.2000	Yes	Yes
Mercury	0.002	--	--	mg/L	0.00037	0.0002	0.0	0.0004	0.0002	0.0002	No	NA[2]
Nickel	0.1	--	--	mg/L	0.0687	0.00056	0.005	0.0858	0.0005	0.0040	No	NA[2]
Perchlorate	--	--	--	mg/L	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	<0.0004	NA[2]	NA[2]
Selenium	0.05	--	--	mg/L	0.012	0.001	0.0060	0.057	0.00137	0.0120	Yes	NA[2]
Silver	--	0.1	--	mg/L	0.01	0.00075	0.0092	0.01	0.01	0.0100	No	NA[2]
Thallium	0.002	--	--	mg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	No	NA[2]
Vanadium	--	--	--	mg/L	0.0253	0.00506	0.0126	0.0709	0.00301	0.0115	NA[2]	NA[2]
Zinc	--	5.0	--	mg/L	0.303	0.00201	0.0452	5.02	0.0023	0.0960	Yes	NA[2]
Organics												
Volatile Organic Compounds (Drinking Water)	-- [9]	-- [9]	-- [9]	mg/L	0.00284	<0.00001	-- [9]	0.00456	<0.00001	-- [9]	-- [9]	NA[2]

mg/L = Milligrams per Liter

-- = (Not Applicable)

[1] Indicates that at least one or more reported concentration exceeds the primary or secondary MCL or RWQCB groundwater quality objective.

[2] NA = (Not Available). To date MCLs and groundwater quality objectives have not been identified for this respective constituent.

[3] RWQCB is an acronym for the Regional Water Quality Control Board. These values represent the RWQCB groundwater quality objectives for the San Pasqual Groundwater Basin.

[4] Detailed salt balance studies are recommended for this area to determine limiting mineral concentration levels for discharge. On the basis on existing data, the tabulated objectives would probably be maintained in most areas. Upon completion of the salt balance studies, significant water quality objective revisions may be necessary. In the interim period of time, projects of ground water recharge with water quality inferior to the tabulated numerical values may be permitted following individual review and approval by the Regional Board if such projects do not degrade existing ground water quality to the aquifers affected by the recharge.

[5] Na is measured as the % Na = (Na / (Na + Ca + Mg + K)) * 100%, where Na, Ca, Mg, and K are expressed in milliequivalent per liter (meq/L)

[6] Secondary MCLs limits presented in order of Recommended/Upper/Short Term.

[7] Average was calculated only using detections recorded above the reporting limit. Therefore, non detect or less than the detection limit values were not factored into the average calculation.

[8] The lowest respective U.S. Environmental Protection Agency or California Department of Health Services constituent MCL value is presented.

[9] As multiple constituents are represented as VOCs, MCLs and average concentrations are not provided.

Based on a review of readily available data, it appears that TDS and nitrate are the two primary constituents of concern within the basin. The most recent concentrations of TDS in the southwestern-most well (state well number 13S/02W-11R1) containing water quality information is 730 mg/L, which indicates that groundwater is leaving the basin with TDS exceeding the recommended secondary MCL of 500 mg/L. Although the most recent concentration of nitrate in the same well is relatively low, average nitrate concentrations in the western SPGMP area are 40 mg/L with a maximum concentration reported at 174 mg/L. This indicates that the nitrate concentrations average just below the MCL of 45 mg/L, but exceed the MCL in some areas.

Total Dissolved Solids: The recommended secondary MCL for TDS is 500 mg/L. TDS concentrations often exceed the recommended MCL throughout the basin and on average are highest in the western, central portions of the basin. As shown on **Table 2-1**, the RWQCB objective for TDS in the San Pasqual Valley is 1000 mg/L because the predominant use of groundwater in the basin is for agricultural irrigation and not for public water supply. As shown in **Table 2-1**, TDS concentrations average 1,254 and 722 mg/L in the western and eastern portion of the basin, respectively. TDS concentrations range between approximately 58 and 4,400 mg/L within the entire basin. TDS average values exceed the secondary MCL and therefore may be a limiting factor for various water uses. **Figure 2-6** illustrates the concentrations of TDS over the time for wells within the western and eastern portions of the basin. The results from the time series data presented indicates that the concentration of TDS in the western portion of the basin has generally increased since 1950 and the TDS concentration in the eastern portion of the basin has shown little significant changes overall. However, in recent years more frequent measurements have shown that TDS has varied significantly in the west-central portion of the basin (well 5669 (12S/01W-32G1)). The results from well 5662 (12S/01W-30R1), located farther west than well 5669, shows a decreasing trend in TDS the most recent years.

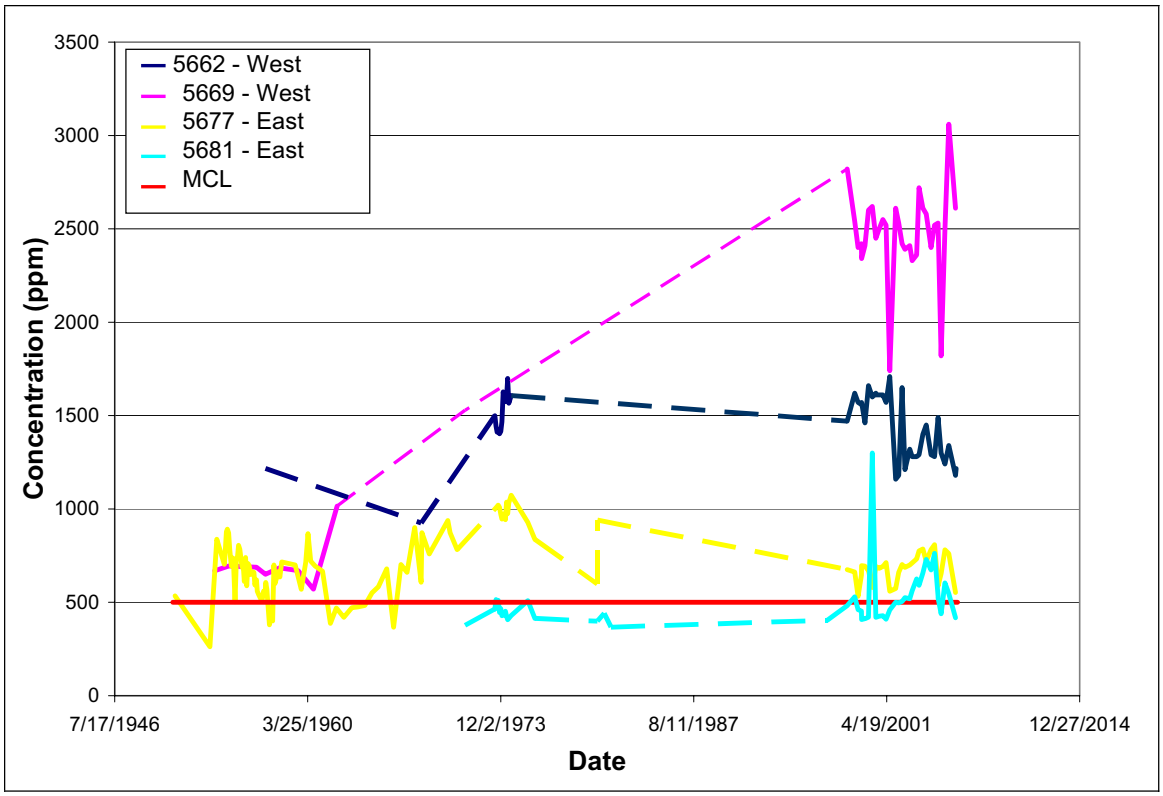

Figure 2-6 - The concentration of total dissolved solids (TDS) from four wells within the eastern and western portions of the basin and the associated Secondary Maximum Contaminant Level (MCL).

Figure 2-7 shows the most recent TDS concentrations measured from wells with water quality measurements illustrating that the wells within the east-central portion of the basin have the highest concentrations, ranging between 417 and 2,610 mg/L or ppm.

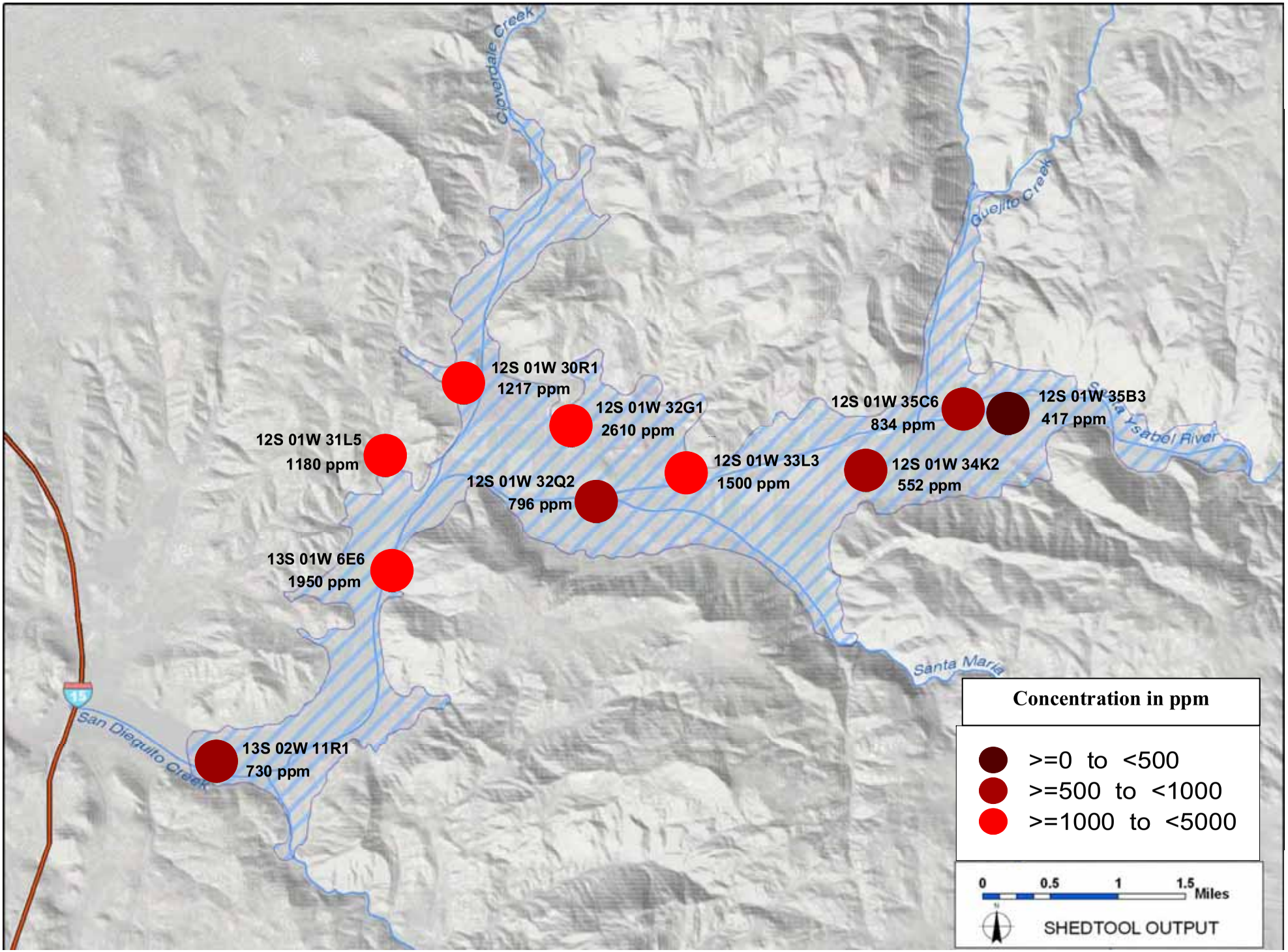

Figure 2-7 - Most recent TDS concentrations measured between 2001 and 2006.

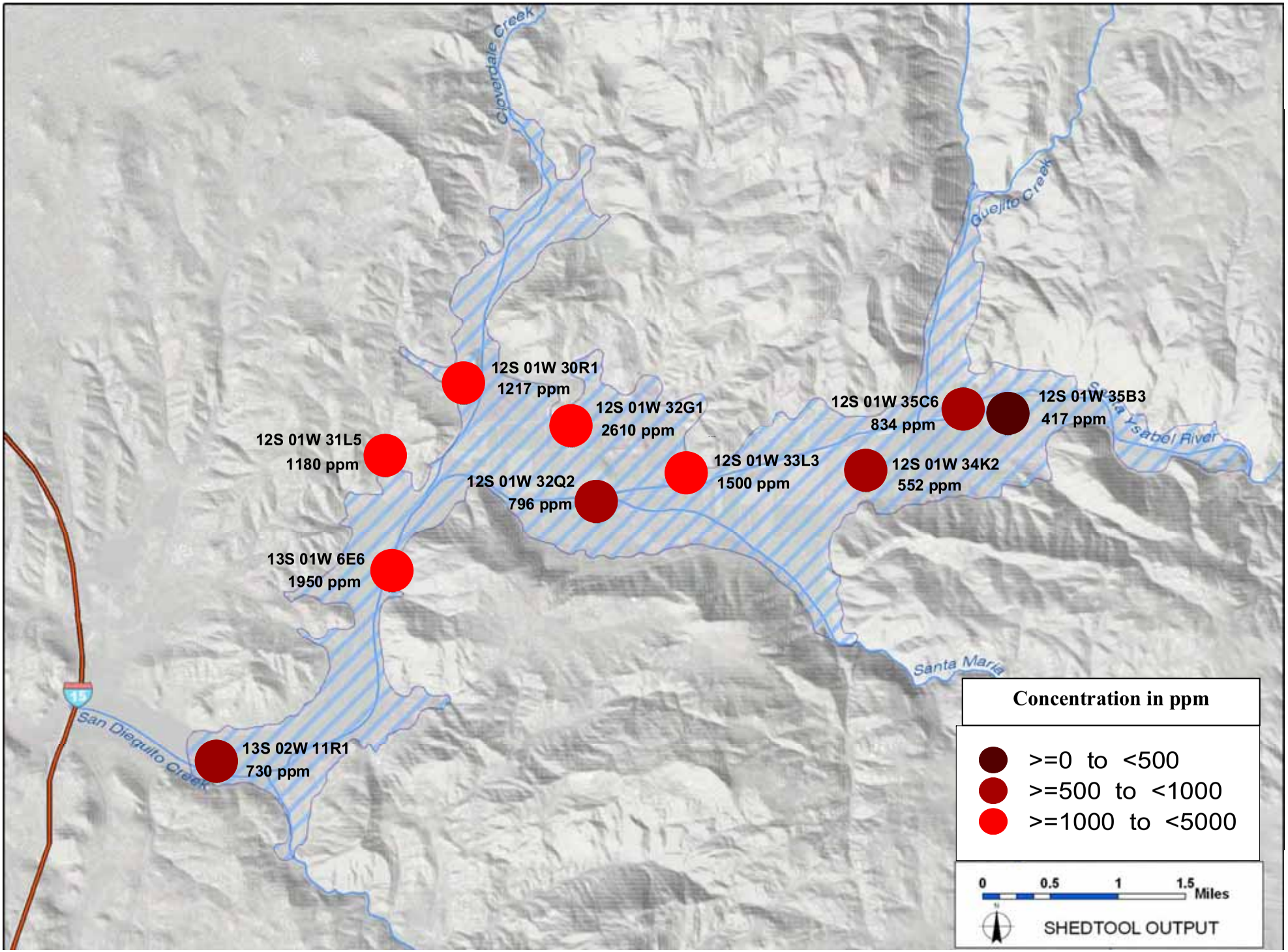

Figure 2-7 - Most recent TDS concentrations measured between 2001 and 2006.

Nitrate: The primary MCL for nitrate (as NO_3) is 45 mg/L. As shown in **Table 2-1** and illustrated on **Figure 2-8**, nitrate concentrations average just less than 45 mg/L in both the western and eastern portions of the basin. Nitrate concentrations have been reported as high as 174 mg/L from one well located in the west-central region of the basin (within the Section 12S/01W-32). Prior to 1995, there were too few wells being monitored to assess the basin-wide water quality for nitrate. However, a better collection of records in 1968 and in 1970 indicate that the highest levels of nitrate within the basin were located within the central-western portion of the basin. The results from the time series data presented in **Figure 2-9** indicates that the concentration of nitrate in the western portion of the basin has generally increased over the period of record and the nitrate concentration in the eastern portion of the basin has shown significant fluctuations. However, in recent years more frequent measurements have shown that nitrate has varied significantly in well 5669 (12S01W32G1), located in the west central portion of the basin. The results from well 5662 (12S01W30R1), located farther west than well 5669 shows a significant increase from the early 1970s, but the most recent measurement showed a significant decrease in the nitrate concentration. Future monitoring at this well may reveal if this sharp decrease in the nitrate concentration is an anomaly. The wells in the eastern portion of the basin have shown fluctuations in the nitrate concentration for the period of record.

The variability in nitrate concentrations over the period of record is potentially due to the slow migration of nitrate through the vadose zone during dry periods, and the fast migration of nitrates into the groundwater during wet periods when the groundwater level rises.

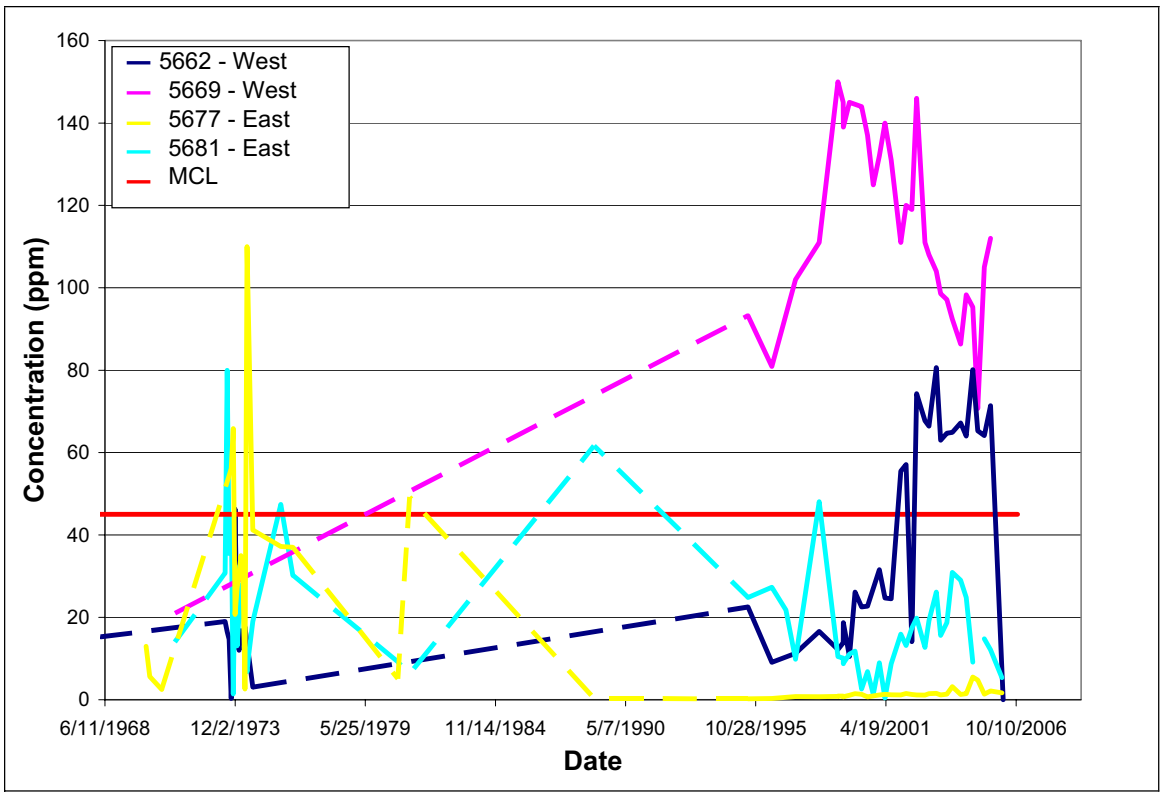

Figure 2-8 - The concentration of nitrate from four wells within the eastern and western portions of the basin and the associated Maximum Contaminant Level (MCL).

Figure 2-9 shows the most recent nitrate concentrations measured from wells with water quality measurements in the last three years, which indicates that the highest nitrate levels have been reported in the central and western portions of the basin. The potential sources of nitrate contamination are from agricultural use of fertilizers, urban and industrial runoff, wastewater discharges, septic system, and sewer overflows (Weston Solutions, 2006).

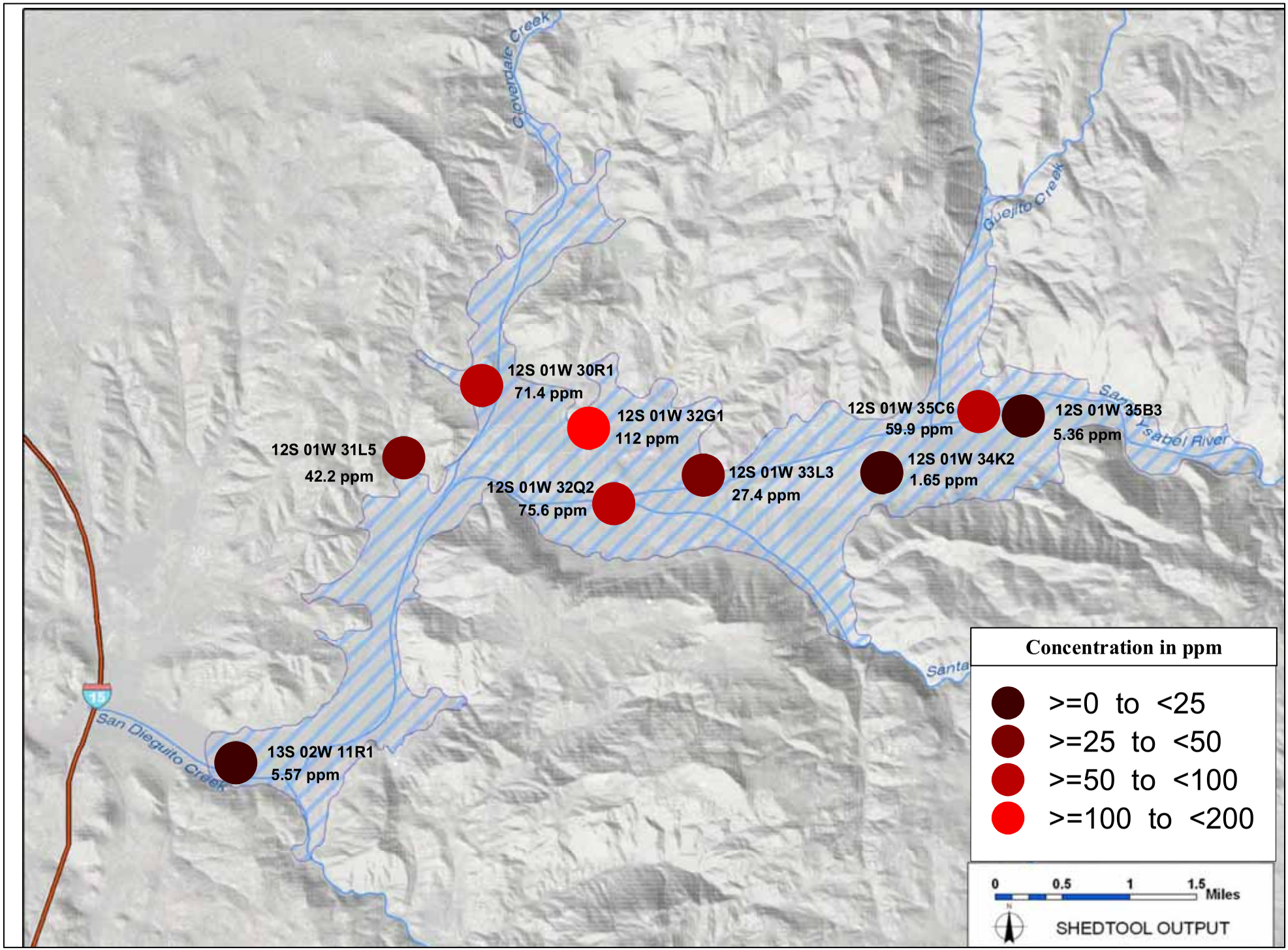

Figure 2-9 - Most recent nitrate concentrations measured between 2003 and 2006.

Iron and Manganese: The secondary MCLs for iron and manganese are 0.3 and 0.05 mg/L, respectively. Iron and manganese concentrations in groundwater often exceed these MCLs. The average concentrations for iron within the western and eastern portion of the basin are approximately 2.06 and 0.304 mg/L, respectively. For manganese, the average concentrations within the western and eastern portion of the basin are approximately 0.292 and 0.151 mg/L, respectively.

Arsenic: The primary MCL for arsenic is 0.010 mg/L, effective as of January 2006. Arsenic is present in groundwater at several locations, but based on available data concentrations have approached but not exceeded the MCL. The maximum concentrations for arsenic within the western and eastern portion of the basin are approximately 0.009 and 0.007 mg/L, respectively.

Chloride: The average chloride concentrations in the western portion of the basin exceed the recommended[5] secondary MCL of 250 mg/L, while the maximum chloride concentrations in the western portion of the basin exceed the upper[6] and short term[7] secondary MCLs of 500 and 600 mg/L, respectively. Chloride is less prevalent in the eastern portion of the basin. The maximum chloride concentration within the eastern portion of the basin exceeds the recommended MCL at 324 mg/L, but the average chloride concentrations are below the MCL at 123 mg/L.

Sulfate: The average sulfate concentrations in the western portion of the basin exceed the secondary MCL of 250 mg/L, while the maximum sulfate concentrations in the western portion of the basin exceed the short term MCL. Sulfate is less prevalent in the eastern portion of the basin. The maximum sulfate concentration within the eastern portion of the basin exceeds the upper secondary MCL at 519 mg/L, but the average sulfate concentrations are acceptable at 122 mg/L.

Selenium and Zinc: The maximum selenium concentration of 0.057 mg/L, which exceeds the primary MCL, is found in the eastern portion of the San Pasqual basin. The maximum zinc concentration of 5.02 mg/L, which exceeds the secondary MCL, is found in the eastern portion of the San Pasqual basin. The average concentrations for both

[5] Constituent concentrations lower than the recommended contaminant levels MCL are desirable for a higher degree of consumer acceptance. (Excerpt from Title 22 California Code of Regulations)
[6] Constituent concentrations ranging to the upper contaminant level MCL are acceptable if it is neither reasonable nor feasible to provide more suitable waters. (Excerpt from Title 22 California Code of Regulations)
[7] Constituent concentrations ranging to the short term contaminant level MCL are acceptable only for existing systems on a temporary basis pending construction of treatment facilities or development of acceptable new water sources (Excerpt from Title 22 California Code of Regulations)

selenium and zinc are below MCLs of 0.05 mg/L and 5 mg/L respectively, in both the eastern and western portions of the basin.

Boron: The maximum boron concentration of 0.194 mg/L is found in the western portion of the San Pasqual basin, and is below the RWQCB Groundwater Quality Objective. There is no primary or secondary MCL for boron. The average concentrations of boron 0.04 mg/L in the east and 0.06 mg/L in the west are below the RWQCB Groundwater Quality Objective.

Volatile Organics and Semivolatile Organics: Volatile and semivolatile organics have been monitored in approximately ten wells within the basin between 1999 and present day. The results from these monitoring efforts have shown that in general these constituents were reported below the detection limit. However a few constituents, including bis-(2-ethylhexyl) phthalate, bromochloromethane, chloroform, and perchlorate have been measured above their detection limits several times within the western portion of the basin. Within the eastern portion of the basin, bis-(2-ethylhexyl) phthalate was the only constituent reported above the detection limit more than once.

In summary, this section has identified 11 compounds that exceed Secondary or Primary MCLs or RWQCB Groundwater Quality Objectives, based on a review of historic groundwater quality data collected by the City of San Diego. These compounds include:

- Chloride
- Fluoride
- Nitrate
- Cadmium
- Iron
- Manganese
- Suflate
- Total Dissolved Solids
- Aluminum
- Selenium
- Zinc

The monitoring plan presented in Section 3 is designed to identify the source of these constituents in the groundwater basin, so that future groundwater quality improvement projects can be designed to remove or reduce the concentration of these compounds below the water quality objectives.

2.3 SURFACE WATER CONDITIONS

Surface water occurs as streamflow in the San Pasqual hydrologic subarea. The Santa Ysabel, Guejito, Santa Maria, and Cloverdale Creeks flow through the basin and leave the hydrologic subarea through the San Dieguito River at San Pasqual Narrows (Izbicki, 1983) as shown on **Figure 2-10**. Under natural conditions, stream flow in San Pasqual Valley is intermittent; however, irrigation runoff and waste water discharge cause protracted flow in some streams. For example, much of the flow in Santa Maria Creek comes from the effluent from the Santa Maria Wastewater Treatment Plant (WWTP), which is discharged on spray fields upstream in the Romona hydrologic subarea (DWR, 1993).

The Santa Ysabel, Guejito, and Santa Maria Creek stream gauge stations are shown on **Figure 2-10**. The average discharge into the basin from each of the creeks, reported by Izbicki (1983), was used to estimate the average percentage of flow that enters the basin from each of the creeks annually and is illustrated in **Figure 2-10**. The rough estimates of the annual input to the basin flow system do not include flow from Cloverdale Creek because it is an ungauged creek and there is no record of flow from this creek.

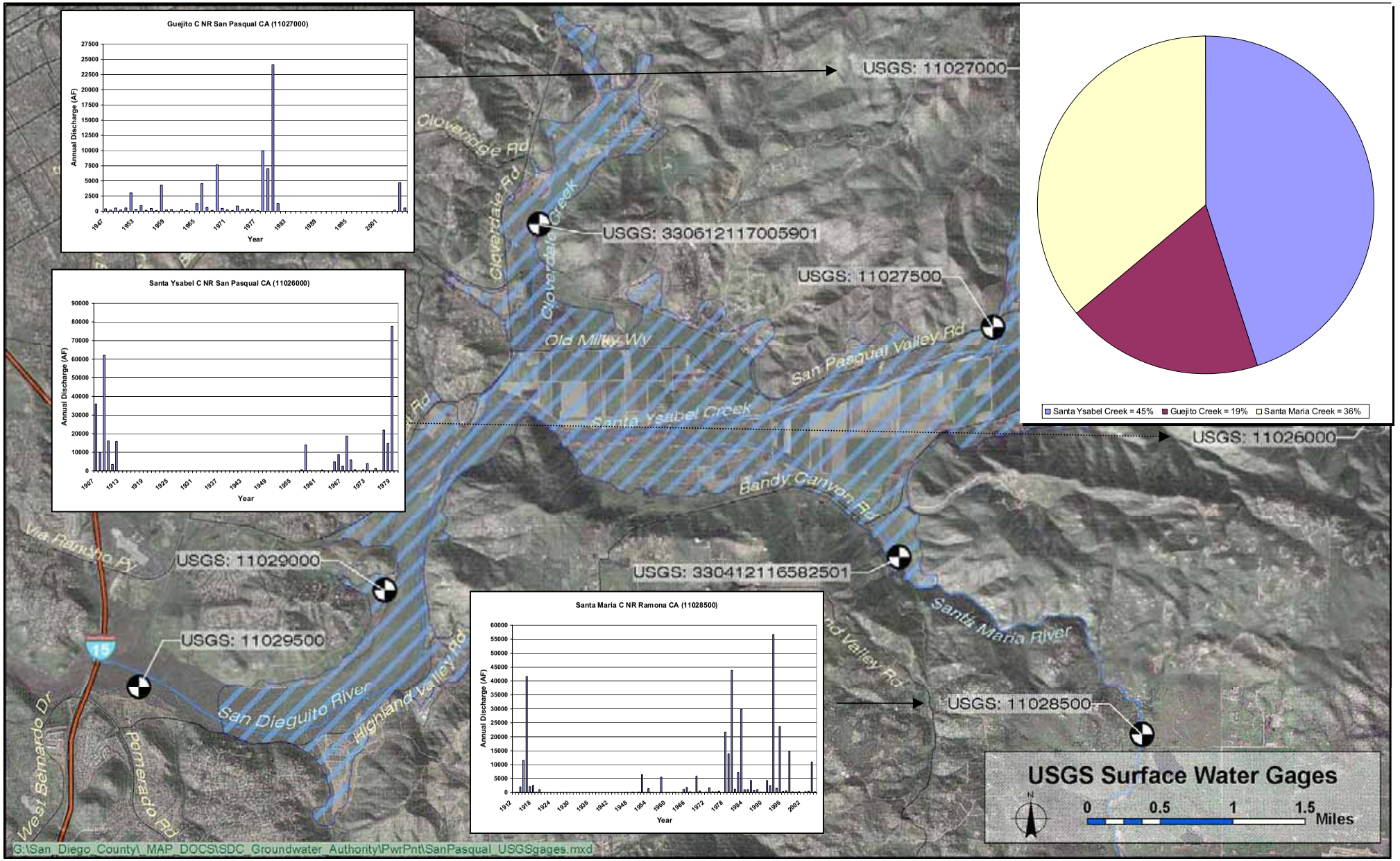

Figure 2-10 - Annual Discharge from USGS Gauging Stations.

2.3.1 Creeks and Rivers: Characteristics and Water Quality

This section describes the general characteristics of the creeks and rivers that flow through the basin in addition to surface water quality data. The creeks and rivers are influenced by surface reservoirs upstream and downstream of the basin. The locations of the major rivers and streams within the basin are illustrated on **Figure 2-10**.

2.3.1.1 Santa Ysabel Creek

Santa Ysabel is the largest creek in the San Pasqual hydrologic subarea and drains approximately 128 square miles of land, much of which is undeveloped and is within the Cleveland National Forest and several Indian reservations. Sutherland Reservoir is the principal reservoir upstream of the basin, which has been used to regulate streamflow in Santa Ysabel Creek since 1954 and has a capacity of 29,680 acre-feet. Previous reports indicate that the creek typically flows 102 days[8] during the year (Izbicki, 1983), at the location of USGS stream gauge: 11026000 shown on **Figure 2-10**. Once this flow reaches the San Pasqual Valley floor, some or all of the flow percolates beneath the steambed and into the underlying groundwater aquifer. The average annual flow for a discontinuous record between 1905 and 1980 has been estimated to be approximately 5,000 acre-feet (Izbicki, 1983). Total annual flow entering the basin on Santa Ysabel Creek is shown on **Figure 2-10**. The average annual discharge from Santa Ysabel Creek accounts for approximately 45% of the inflow into the basin on an annual basis as illustrated on **Figure 2-10**.

There is very little information available about the water quality of the Santa Ysabel Creek. Two water quality sampling surveys were conducted by the USGS, in 1981 and 1982, and showed that the Santa Ysabel Creek had good water quality with all measured constituents below the MCLs. The water quality of the Santa Ysabel Creek is a function of the water quality at Sutherland Reservoir from which the creek water is released. The water quality of the Sutherland Reservoir was monitored between 1996 and 2000 (City of San Diego). The summary of results from this period of time indicates that a few constituents exceeded primary or secondary MCLs at some point during the survey period. These constituents include: TDS (maximum = 1,150 mg/L), turbidity (average = 4.4 NTU), color (average = 31), aluminum (maximum = 1.49 mg/L), manganese (average = 0.056 mg/L), and methyl tert-butyl ether (MTBE) (maximum = 0.0171 μg/l). Surface

[8] The median number of days with flow greater than 0.1 ft^3/s as reported by Izbicki (1983).

water sampling was performed by DWR in March of 1991 (DWR, 1993). Sampling locations and a summary of results are included in **Appendix E**.

2.3.1.2 Guejito Creek

Guejito Creek drains an undeveloped watershed approximately 22 square miles in size and typically flows 148 days[9] per year (Izbicki, 1983). Once this flow reaches the San Pasqual Valley floor, some or all of the flow percolates beneath the steambed and into the underlying groundwater aquifer. Total annual flow entering the basin on Guejito Creek at USGS steam guage 11027000 is shown on **Figure 2-10**. The streamflow in this creek is unregulated except for several small diversions. The median annual discharge from this ephemeral creek is 290 acre-feet, which is the second largest annual median discharge of the three gauges creeks in the basin. The average annual flow from the creek has been reported for a period between 1946 and 1981 to be approximately 2,110 acre-feet and accounts for approximately 19% of the inflow into the basin on an annual basis. Monitoring of this stream gauge ceased in 1981, but resumed in 2004. The estimated average annual flow from 2005 and 2006 is approximately 1,860 acre-feet.

Two USGS surveys were conducted in 1981 and 1982 to measure the water quality of the Guejito Creek. The surveys revealed good water quality within the creek, with all measured constituents below MCLs. However, this limited amount of data available from this creek makes it difficult to estimate current conditions. Surface water sampling was performed by DWR in March of 1991 (DWR, 1993). Sampling locations and a summary of results are included in **Appendix E**.

2.3.1.3 Santa Maria Creek

The Santa Maria Creek drains approximately 58 mi^2 and is unregulated except for a few small diversions. Izbicki (1983) estimated that the Santa Maria Creek flows 53 days[10] per year. Once this flow reaches the San Pasqual Valley floor, some or all of the flow percolates beneath the steambed and into the underlying groundwater aquifer. Total annual flow entering the basin on Guejito Creek at USGS steam guage 11027000 is shown on **Figure 2-10**. Flows from the Santa Maria Creek are dampened by a watershed farther upstream and exhibit a mean annual discharge of 145 acre-feet, which is

[9] The median number of days with flow greater than 0.1 ft^3/s is as reported by Izbicki (1983).
[10] The median number of days with flow greater than 0.1 ft^3/s as reported by Izbicki (1983).

considerably less than expected due to the size of the watershed and average annual precipitation within the subarea of 11 to 15 inches per year (Izbicki, 1983; DWR, 2003). In many years the creek does not flow at all. The average annual flow was estimated as 4,050 acre-feet and accounts for approximately 36% of the inflow into the basin on an annual basis (Izbicki, 1983).

One USGS survey was conducted in 1982 to measure the water quality of the Santa Maria Creek. The survey revealed a TDS concentration of 714 mg/L and specific conductance of 1,190 μS/cm. Both exceeded the MCL of 500 mg/L and 900μS/cm respectively. Estimation of current water quality conditions is difficult due to the absence of data. Surface water sampling was performed by DWR in March of 1991 (DWR, 1993). Sampling locations and a summary of results are included in **Appendix E**.

2.3.1.4 Cloverdale Creek

Cloverdale Creek drains an 18 mi^2 watershed by unregulated and ungauged streamflow and has turned into a perennial stream due to irrigation return water from avocado groves. No average annual flow estimates are available for this creek; therefore the inflows from this creek into the basin can not be quantified.

One USGS survey was conducted in 1982 to measure the water quality of the Cloverdale Creek. The survey revealed a TDS concentration of 945 mg/L, and a specific conductance of 1,590 μS/cm, which exceeded the respective MCLs for these constituents. Estimation of current water quality is difficult because of the lack of recent data. Surface water sampling was performed by DWR in March of 1991 (DWR, 1993). Sampling locations and a summary of results are included in **Appendix E**.

2.3.1.5 San Dieguito River

The San Dieguito River begins at the confluence of Santa Ysabel Creek and Santa Maria Creek. The San Dieguito River drains the entire San Pasqual basin and flows out of the basin into Lake Hodges. Historical records of flow from the basin were recorded at USGS gauge stations 11029000 and 11029500, which are no longer actively monitored today. The annual discharge was measured at USGS station 11029500 between 1912 and 1915. The approximate annual discharge through the gauge station increased over the period from 2,049 acre-feet (1912), 2,043 acre-feet (1913), 21,408 acre-feet (1914), to

70,980 acre-feet (1915). Monthly storage in the Lake Hodges Reservoir is recorded by San Diego County.

Two USGS surveys were conducted in 1981 and 1982 to measure the water quality of the San Dieguito River. The survey revealed a TDS concentration of 945 mg/L, and specific conductance of 1,590 μS/cm, which exceeded the respective MCLs for these constituents. The present day water quality is difficult to estimate because no current data exists. Surface water sampling was performed by DWR in March of 1991 (DWR, 1993). Sampling locations and a summary of results are included in **Appendix E**.

2.4 WATER AND LAND USE

In 1997, 90 percent of the potable water being delivered to the San Diego region was imported from the Colorado River and northern California (Metcalf and Eddy, 1997). However, the City of San Diego has made groundwater available in the San Pasqual Valley to leaseholders for the cost of developing the wells plus the cost of pumping the water, which typically is less than the cost of imported water (City of San Diego Planning Department, 2006). It is believed that the primary water supply within the basin by leaseholders is from groundwater.

The USGS and DWR estimated net groundwater extraction for the period between 1970 and 2000 to range between 6,000 AF/yr and 6,300 AF/yr. The use of surface water and recycled water within the basin is not estimated. **Figure 2-11** is a land use map based upon the 1998 data for the region produced by DWR.[11] Although a more recent land use map for the basin is available through the City of San Diego, the DWR map was used because it included specific information about the crop types, which was then used to estimate the water use. The water use was estimated using the total acreage of each crop type and the evapotranspiration of applied water (ETAW) values for the different crops in the DWR Detailed Analysis Unit (DAU) for Temecula, CA. Temecula was the closest town in the South Coast region that had ETAW values for crops in the DAU and was selected to best represent the conditions in the San Pasqual basin. The water use estimated using the ETAW values and crop acreage was approximately 8,800 AF/yr.[12]

[11] The land use map shows a 500 ft buffer zone around the boundary of the basin, in order to capture all of the area potentially affected by the modification to the basin boundary. However, the estimated water use above only takes into account the region within the San Pasqual boundary.

[12] The estimated water use is based upon DWR calculated evapotranspiration of applied water (ETAW) factors for different crops and estimates of urban water use from an unpublished MWH report (2005). The estimated water use demand could potentially underestimate the true use due to the modification to the basin boundary.

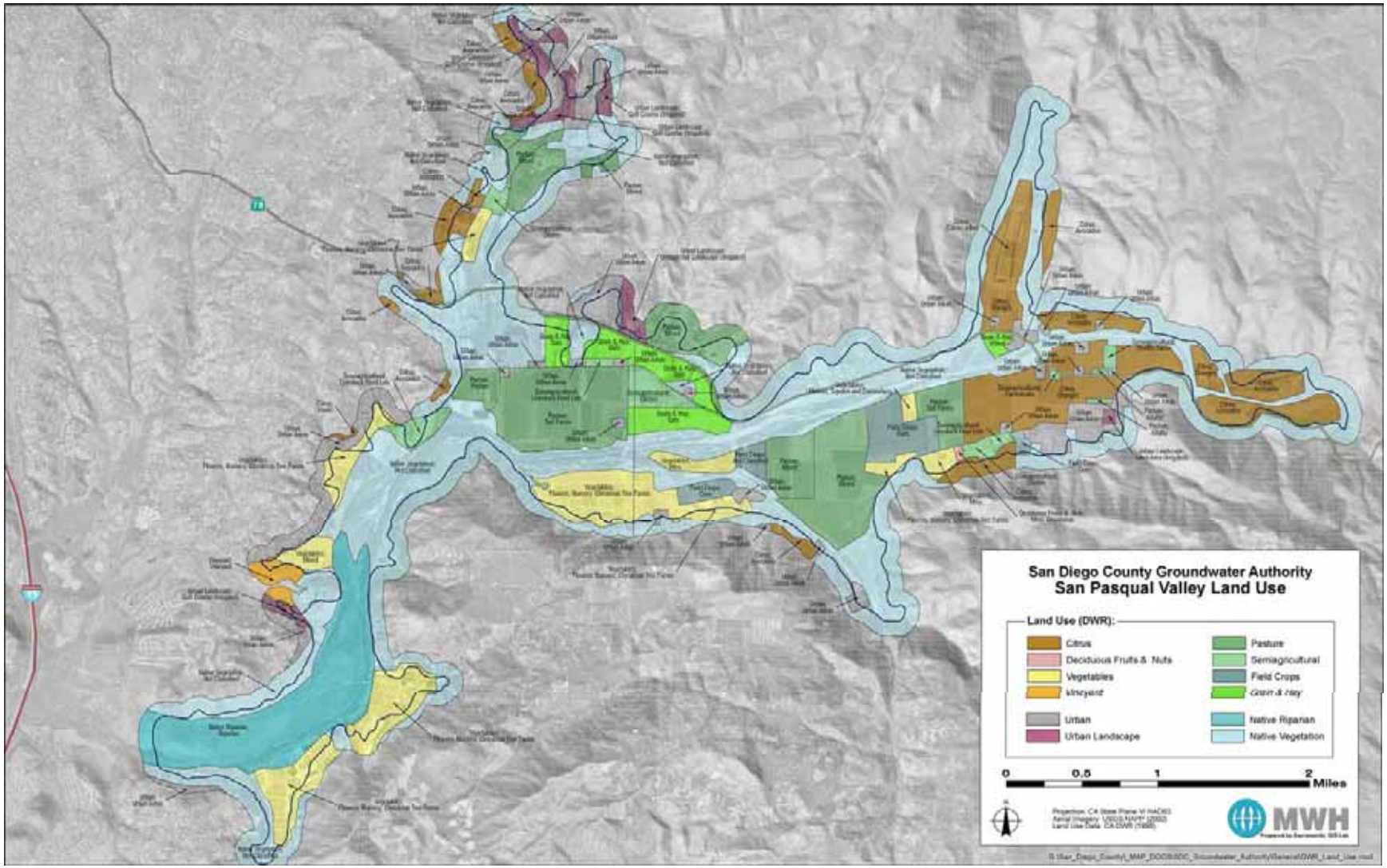

Figure 2-11 - San Pasqual Valley Land Use Map (modified from DWR, 1998)

2.4.1 Land Use

The land use within the San Pasqual Valley is illustrated in **Figure 2-11** and listed on **Table 2-2**. Native vegetation accounts for almost half of the land within the basin. Land classified as pasture accounts for approximately 17 percent of the land, while land classified as citrus for producing citrus fruits accounts for approximately 13 percent of the land. Vegetables, native riparian vegetation, and urban area account for the next largest percentages of land, ranging between 10 percent and 10 percent area of the land. The remainder of the land is split among field crops, grains and hay, semi-agricultural land (includes livestock feed lots, dairies, and farmsteads), urban landscape, and vineyards.

2.4.2 Water Budget

The following section presents the inflows and outflows from the San Pasqual basin. **Table 2-3** provides a summary of the water budget components described in this section with the source information referenced in the footnotes. The estimates summarized in this section represent best available information at the time this GMP was published. The City of San Diego recognizes that some of these estimates are old and actual values have likely changed due to changes in cropping and irrigation practices. San Diego will support efforts to update the water budget as the GMP and groundwater improvement projects are implemented in the basin.

Table 2-2 - DWR Land Use Subclasses and Acreage

DWR Subclass	Acres
Avocados	198
Citrus- other	26
Oranges	409
Misc. Deciduous	3
Corn	131
Not Classified	23
Oats	182
Wheat	17
Riparian	481
Not Classified	1716
Alfalfa	7
Mixed	443
Pasture	40
Turf Farms	347
Dairies	80
Farmsteads	3
Livestock Feed Lots	37
Poultry Farms	9
Urban Areas	238
Golf Course (Irrigated)	43
Lawn Area (Irrigated)	5
Ornamental Landscape (Irrigated)	4
Flowers, Nursery, Christmas Tree Farms	394
Melons, Squash and Cucumbers	11
Misc.	54
Mixed	37
Vineyard	5

Table 2-3 - Estimated Water Budget Components

Inflows	**Average (AF/yr)**	**Source/ Comment**	**Period of Estimate (Years)**
Streambed Infiltration	3,000	A	1947-1990
Agriculture Return Flows (from groundwater)	4,300	A	-
Agriculture Return Flows (from imported water)	1,910	B	2000
Deep Percolation of Precipitation	932	B	1931-1999
Subsurface Inflow from Tributaries	1,200	A	-
Total Inflows	11,342		
Outflows			
Groundwater Pumping	8,800	C	1998
Evapotranspiration	2,057	B	1931-1999
Underflow Out to Lake Hodges	430	B	-
Total Outflows	11,287		
Change in storage	55		

Sources:
A. Greeley and Hansen, 1993
B. CH2MHill, 2001
C. MWH, 2007

2.4.2.1.1 Inputs

The primary inflow to the basin comes from creek recharge. The four creeks which provide recharge to the basin are ephemeral and include the Santa Ysabel Creek, Guejito Creek, Santa Maria Creek and Cloverdale Creek, which meet at the confluences of the San Dieguito River. The creeks flow during storm events which primarily occur in this area between November and April. In previous investigations, the recharge from creeks was estimated to account for more than 80% of the total recharge to the basin each year (CH2MHill, 2001). Estimates of the annual recharge from streamflow infiltration in the San Pasqual basin were developed for the City of San Diego Reservoir Management Study and were estimated to be 3,000 acre-ft (Greeley and Hansen, 1993).

Additional inputs to the basin include agricultural return flows from irrigation with groundwater and imported water. Agricultural return flows of groundwater were estimated by DWR (1983) between 1970 and 2000 (projected) to be approximately 20 to 35 percent of the applied water. These values ranged between 2,860 and 3,920 AF/yr. However, in a more recent study, Greeley and Hansen (1993) estimated the agricultural return flows to be approximately 50 percent of the applied water. The agricultural return flow was estimated as approximately 4,300 AF/yr (Greeley and Hansen, 1993). In addition to agricultural return flows of native groundwater, agricultural return flows of imported water also acts to recharge the basin. Imported water use in the basin increased between 1970 and 1980 from 2,140 to 3,560 acre-ft (Izbicki, 1983). Imported water was primarily used for irrigation of avocado groves west of Cloverdale Canyon and for use in the San Diego Wild Animal Park (Izbicki, 1983). As a result, total irrigation return flow of imported water increased from 710 AF/yr to 1,160 AF/yr between 1970 and 1980 (Izbicki, 1983). In a recent study, CH2MHill (2001) used this historical data in addition to the 1998 DWR land use survey to linearly interpolate the irrigation return flows of imported water in 2000. The irrigation return flow from imported water was estimated to be 1,910 AF/yr in 2000 (CH2MHill, 2001).

Recent introduction of drip irrigation practices in the basin have likely decreased the volume of groundwater pumping required to meet crop demand. However, deep percolation of applied water and agricultural return flows of imported water has also decreased since drip irrigation was introduced, so the net impact on groundwater storage requires further evaluation in future groundwater modeling efforts.

Deep percolation from precipitation provides a small source of recharge to the basin each year. Greeley and Hansen (1993) estimated that the volume of natural recharge from precipitation was approximately 300 AF/yr, which is approximately 10 percent of the annual precipitation in the basin. In a more recent study, CH2MHill (2001) used a set of empirical relationships developed by scientists in Southern California to quantify recharge of precipitation falling on irrigated land. From the empirical relationships, the average deep percolation was estimated as 932 AF/yr for the period between 1931 and 1999.

Finally, subsurface inflows to the groundwater basin from Rockwood Canyon, Bandy Canyon, and Cloverdale Canyon provide a small source of recharge. Greeley and Hansen (1993) reported that the average historical inflows from Rockwood Canyon, Bandy Canyon, and Cloverdale Canyon were 300 AF/yr, 300 AF/yr, and 600 AF/yr respectively.

2.4.2.1.2 Outputs

The primary outflow from the basin is from groundwater pumping. The volume of groundwater pumped from the basin each year is still unknown. Estimates have reported that the net groundwater pumping, which is equivalent to the total groundwater pumped minus the groundwater returned by percolation after irrigation, ranges from 3,000 AF/yr to 7,200 AF/yr (Greeley and Hansen, 1992). However, based upon the agriculture present in the valley in 1993, Greeley and Hansen (1993) estimated the total groundwater pumped for irrigation to be approximately 8,600 AF/yr. Water use estimates using the 1998 DWR land use map (**Figure 2-11**) indicate that the water use is approximately 8,800 AF/yr.

A second source of discharge from the basin is evapotranspiration from native wetlands. CH2MHill (2001) reported that approximately 795 acres of native wetlands exist in the groundwater basin and consume groundwater at a rate ranging between 1.5 to 3 ft/yr. CH2MHill estimated that the average annual loss due to evapotranspiration of native wetlands was approximately 2,057 AF/yr.

Finally, subsurface flow occurs in the lower part of the basin where groundwater flows along a hydraulic gradient into the Lake Hodges Reservoir. Greeley and Hansen (1993) estimated the subsurface flow to be 300 AF/yr. In a more recent study, CH2MHill (2001) estimated that the underflow ranges between 285 and 575 AG/yr.

2.4.2.1.3 Change in Storage

A summary of the inflows and outflows from the basin are present in **Table 2-3** based upon the estimates of the average annual inflows and outflows to the system, the change in storage was estimated as approximately 55 AF/yr. However, the results presented above combine the most recent estimates of flows from two separate studies. The study completed in 1993 by Greeley and Hansen reported that annual average conditions in the basin indicate that there is no change in storage, which indicates that the inflows to the basin are equal to the outflows from the basin. The results from the CH2MHill (2001) report indicate that on average, there is only a small change in storage (a loss of less than 500 AF/yr) due to higher outflows than inflows within the basin. However, between 1990 and 1999, CH2MHill (2001) reported that the change in storage has ranged between approximately -6,500 AF to 12,500 AF.

2.5 INVASIVE NON-NATIVE SPECIES IN SAN PASQUAL VALLEY

The Water Department recognizes that invasive species, particularly giant reed (*Arundo donax*) and tamarisk (*Tamarix* spp.), affect the quality and quantity of water resources. The Water Department is supportive of any efforts to manage and eradicate invasive species in San Pasqual Valley, the San Dieguito River watershed, and our region at large. For example:

1) The Mission Resource Conservation District has proposed a Northern San Diego County Invasive Non-native Species Control Program (Program). San Pasqual Valley would be a target area of this Program. Work already completed for this Program includes mapping of invasive plants and detailing of the regulatory permits and permissions needed to carry out removal of invasives. Specific removal projects will be done as funding is available. The Program has applied to the IRWM Plan for Proposition 50 and Proposition 84 grant funding. A map of invasives within San Pasqual Valley, based on this effort, is provided in **Appendix F**.

2) The San Dieguito Watershed Council. The mission of the Council is to facilitate implementation of the San Dieguito Watershed Management Plan which includes among its primary goals the control and eradication of key invasive species, including Arundo and Tamarisk. The Water Department is a member.

3) The San Dieguito River Valley Conservancy is developing a Weed Management Plan for the San Dieguito Watershed. The Water Department is a cooperating partner in this effort.

4) The San Dieguito River Park JPA and the County of San Diego have a project to eradicate perennial pepperweed [*Lepidium latifolium]* in San Pasqual Valley. The Water Department contributed staff time and expertise to the project.

5) The Water Department, County of San Diego and the San Diego County Water Authority have also recently development the draft San Diego Integrated Regional Water Management Plan (IRWM Plan). The purpose of this plan is to outline and implement a multi-stakeholder strategy to protect, manage and develop the water resources of our region in a sustainable manner. The management and control of invasive species is one of the objectives of the IRWMP.

Adoption of the Groundwater Management Plan (GMP) by the City Council will allow the City to pursue grant funding to further understand the resource and implement appropriate measures to protect and develop the resource. The control and management of invasive species is a complex and challenging issue for our region that requires a continuing collective effort of all stakeholders.

In addition to the stakeholder efforts listed above, the City of San Diego has been approached by a group of leases in the basin that have solicited a proposal from a sand and gravel company to remove invasive species. The proposed work would:

- Restore approximately 3.0 miles of sediment-choked streambed from approximately the Narrows on the San Dieguito River to within 1 mile of the State Route 78 bridge over Santa Ysable Creek

- Create and maintain a 100-foot wide by 8 foot deep pilot channel free of vegetation to convey flow during normal and high events.

- Side slopes would be planted with native riparian species and an 11.23-acre upland area adjacent to the river will be enhanced for burrowing arroyo toads.

- The project would be privately funded with revenues gained from sale of sand excavated in the construction of the pilot channel

2.6 IMPLICATIONS FOR MANAGEMENT OF GROUNDWATER

This section briefly discusses the implications for management of groundwater in the SPGMP area, based on the basin conditions presented in Section 2.0.

Groundwater quality data presented in Section 2.2.3 indicates that much of the information is old and historic record is incomplete for most of the groundwater monitoring points throughout the basin. Therefore it is difficult to evaluated long term trends and, more importantly, identify source areas for groundwater contamination that exisits in the basin. This indicates that groundwater quality monitoring, following consistent data collection protocol, be a central focus for San Diego under this Groundwater Management Plan. Management actions presented in the next chapter describe ways to improve standards to protect water quality, monitor water quality, and characterize the conditions in the basin.

Information on both stream flows and groundwater elevations, provided in this Section, demonstrate that the hydrology varies greatly depending on year-type. Groundwater elevations in the eastern portion of the basin drop quickly during dry periods, but also recover very quickly during wet periods. The response of the basin to natural hydrology must be considered and accounted for if the groundwater basin is to be developed as a more sustainable supply for agriculture and municipal supply in the future. The data presented in Section 2 indicates that if groundwater extractions are increased, artificial recharge may be required in many or most years, to meet the water demands in the basin and not put the groundwater basin into overdraft. Management strategies developed in the next chapter will focus on the need to prevent groundwater overdraft in the basin.

Surface water quality data presented in this Section is old and may no longer be representative given changes in landuse in the watersheds they drain. The SDWMP states that the County of San Diego along with numerous other State and local agencies in and around the SPGMP area are covered under the National Polutant Discharge Elimination System (NPDES) for discharges of urban water runoff to the waters of the United States (Weston Solutions, 2006). Therefore, the quality of surface water from the four creeks that supply the basin with surface water should be protected under the NPDES program. However, several PAC members involved in the development of this GMP expressed concern that urban water runoff is degrading the quality of San Pasqual's groundwater. The monitoring program described in Section 3 will enable San Diego to

better characterize changes in groundwater quality in response to urban water runoff and take approriate action to protect groundwater if warrented..

2.7 DATA GAPS

A few data gaps within the SPGMP area have been identified and will be addressed through management actions described in Section 3. The more significant data gaps include:

- Groundwater levels from additional wells located in the alluvial portion of upstream tributeries, and other portions of San Pasqual Basin, not currently monitored.

- Groundwater quality from additional wells located in the alluvial portion of upstream tributeries, and other portions of San Pasqual Basin, not currently monitored.

- Surface water flow data from into and out of the basin. The current record does not include flow data on all steams entering the basin. Furthermore, the record of data on existing stream gauages is discontinuous making it impossible to evaluate long term trends. Finally, urbanization has likely changed how creeks such as Cloverdale, Santa Maria, and Santa Ysabel flow in wet years and dry, so it is important to collect and evaluate recent data when preparing water budgets for the basin.

- Groundwater production is estimated based on landuse information and estimated crop water use demands. The actual locations of groundwater pumping to meet this demand are unknown.

- Groundwater production characteristics of the bedrock underlying the alluvial portion of the San Pasqual Basin.

Management Actions are presented in the next section and many of these initial actions outline in the GMP focus on filling the data gaps listed above. This is an important first step that needs to occur to improve the planning and design of groundwater improvement projects in the basin.

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Section 3 – Management Plan Elements

Section 3 of this San Pasqual Groundwater Management Plan (SPGMP) provides a description of management plan elements developed for the San Pasqual groundwater basin (basin). **Figure 3-1** illustrates the flow of information within Section 3 from a general goal statement to five supporting basin management objectives (BMOs) from which five component categories have been established with specific measurable management actions to be implemented by the City of San Diego (San Diego). This section also describes the purpose of the goal statement, BMOs, and management actions, and how they were prepared, reviewed and finalized. Together these will result in improving the water quality and supply reliability for stakeholders within the San Pasqual Valley.

3.1 GROUNDWATER MANAGEMENT GOAL

The following goal statement was prepared by San Diego staff for the SPGMP:

> *The goal of the SPGMP is to "understand and enhance the long-term sustainability and quality of groundwater within the basin, and protect this groundwater resource for beneficial uses including water supply, agriculture, and the environment."*

This goal statement is consistent with the April 27, 2005, City Manager's report (No. 05-105), titled San Pasqual Vision Plan Council Policy. This report recommended that the City Council adopt a policy to comprehensively protect the water, agricultural, biological and cultural resources within the San Pasqual Valley. The Council adopted a policy (600-45) on June 27, 2005 that required development of a GMP in order to protect the groundwater resources within the basin.

This goal statement is also consistent with the Long-Range Water Resources Plan (LRWRP) adopted by San Diego in December 2002. The LRWRP evaluated different water supply alternatives for meeting the City's current and future water needs. The purpose of LRWRP was to find ways to reduce the City's dependence on imported water. The SPGMP will serve as a planning foundation for future water resources investigations and projects within the basin.

This goal statement was presented to, and accepted by, the Project Advisory Committee (PAC) members during the first of a series of four PAC meetings on October 26, 2006

and to the public at the first Open House on December 06, 2006. The PAC was formed to provide input and recommendations from the lessees and other stakeholders in the basin or adjacent to the basin during the development of the SPGMP. The formation of the PAC is further described in Section 3.5 and a listing of PAC members is provided within the Public Outreach Plan in **Appendix G**.

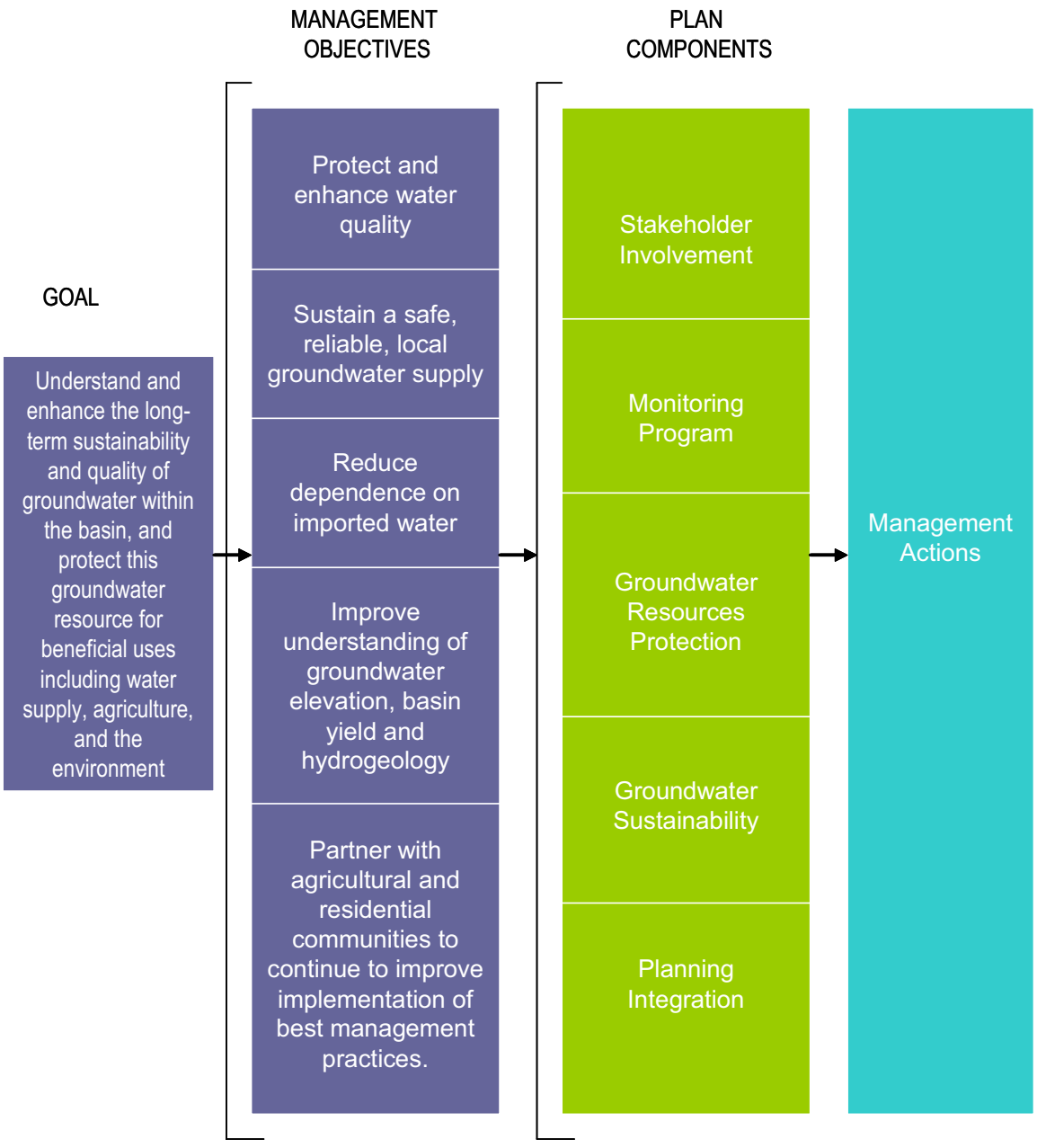


Figure 3-1 – Organization of Management Plan Elements

Development of BMOs

A BMO has five main components:

1) The background and issues related with the BMO;

2) Specific objective(s) that can be measured with some level of confidence;

3) The programs or actions that are available to remedy a problem, if one is determined to exist;

4) A clearly defined monitoring program designed to collect data necessary to evaluate the BMO's performance; and

5) A reporting method of presenting monitored data to identify success or forewarn of challenges with groundwater management.

Each of these is explained in greater detail with references to sections in the Water Code, citations from the *California Groundwater Management Guidelines* (Groundwater Resources Association of California, Second Edition, 2005).

The California State Water Code § 10753.7 (a) (1) states that the required components of a GMP include the following relative to management objectives:

> (1) Prepare and implement a groundwater management plan that includes basin management objectives for the groundwater basin that is subject to the plan. The plan shall include components relating to the monitoring and management of groundwater levels within the groundwater basin, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater pumping in the basin.

This portion of the Water Code implies that BMOs and actions taken to achieve these objectives need to have sufficient specificity in numerical objectives so as to be measurable in its implementation through monitoring and management programs. At the same time, the BMOs are intended to be flexible so as to be adaptive to increase knowledge of how the groundwater basin behaves over time as better monitoring data is collected. To meet these co-equal objectives, San Diego has prepared general BMO

statements accompanied by specific and measurable methods for implementing. Additional specificity is provided with the actions listed under each component category provided later in this chapter.

Based on these guidelines, the City initially developed a set of six (6) draft BMOs. As a result of stakeholder input, two of the six have been combined.

The five final BMOs, accepted by the PAC, are listed below:

1) Protect and enhance groundwater quality.

2) Sustain a safe, reliable local groundwater supply.

3) Reduce dependence on imported water.

4) Improve understanding of groundwater elevations, basin yield and hydrogeology.

5) Partner with agricultural and residential communities to continue to improve implementation of best management practices.

3.2 BASIN MANAGEMENT OBJECTIVES (BMO)

This section describes the intent and general background and the method/approach to achieve the desired outcome of each BMO.

3.2.1 BMO#1 - Protect and Enhance Groundwater Quality.

BMO#1 is intended to protect and enhance the groundwater quality in the basin by locating and reducing groundwater contamination, protecting recharge areas, and improving recharge water quality.

Background

As documented in Section 2, groundwater quality within the basin changes significantly depending on location. In general, the average reported concentrations of total dissolved solids (TDS) and nitrates are approximately twice the levels in the western portion of the basin than the eastern portion. TDS and nitrate concentrations at many wells often exceed the respective Department of Health Services (DHS) drinking water standards

(Maximum Contaminant Levels {MCLs}) and Regional Water Quality Control Board (RWQCB) groundwater quality objectives, respectively.

Furthermore, it is understood that natural recharge of groundwater occurs primarily from percolation of irrigation water, infiltration along creeks and drainages, percolation of precipitation, and subsurface inflow. Protection of natural recharge is an important element of protecting and enhancing groundwater quality.

The SDWMP (Weston Solutions, 2006) identified several objectives to address this BMO, which included the following:

- Diminish and eliminate further degradation of the watershed and its resources through better management practices.
- Protect, enhance and restore beneficial uses of watershed.
- Develop an effective approach to meeting water quality regulations for the watershed.
- Promote science-based methods for water quality and environmental assessment of the watershed.
- Obtain grant funds to implement watershed improvement projects.
- Protect Reservoirs and Support Emergency Storage Project (ESP) efforts.

Methods/Approach

In order to meet this BMO, San Diego will work toward accomplishing multiple activities including:

- The City will collect and analyze additional monitoring data to better understand the sources and relative volumes of constituents in groundwater. In the future collected data will be analyzed and used to identify data gaps or additional data needs. For this reason, San Diego's monitoring program will likely be modified in the future to bridge potential gaps and meet new data needs.
- Data collected and analyzed will be the basis of developing source control strategies.

- Groundwater remediation techniques may be implemented where contamination is identified.

- San Diego will further characterize areas where water enters the basin. Identification of recharge areas will be used in conjunction with the identification of point and non-point source water quality entering into the basin, in an effort to ensure that recharge water is of the highest quality possible.

- San Diego will continue to investigate the feasibility of implementing conjunctive use and groundwater desalination in the basin. Implementation priority will be given to feasible projects that improve groundwater quality in addition to water supply reliability.

Desired Outcome

As described in San Diego's Vision Plan for San Pasqual and Council Policy 600-45, the City will work toward protecting and enhancing groundwater quality for the benefit of basin groundwater uses. As illustrated on **Figure 3-2** in general this BMO will be met when groundwater quality constituent concentrations in the basin are brought to concentrations below their respective MCLs and RWQCB Basin Objectives as shown in **Table 2-1**.

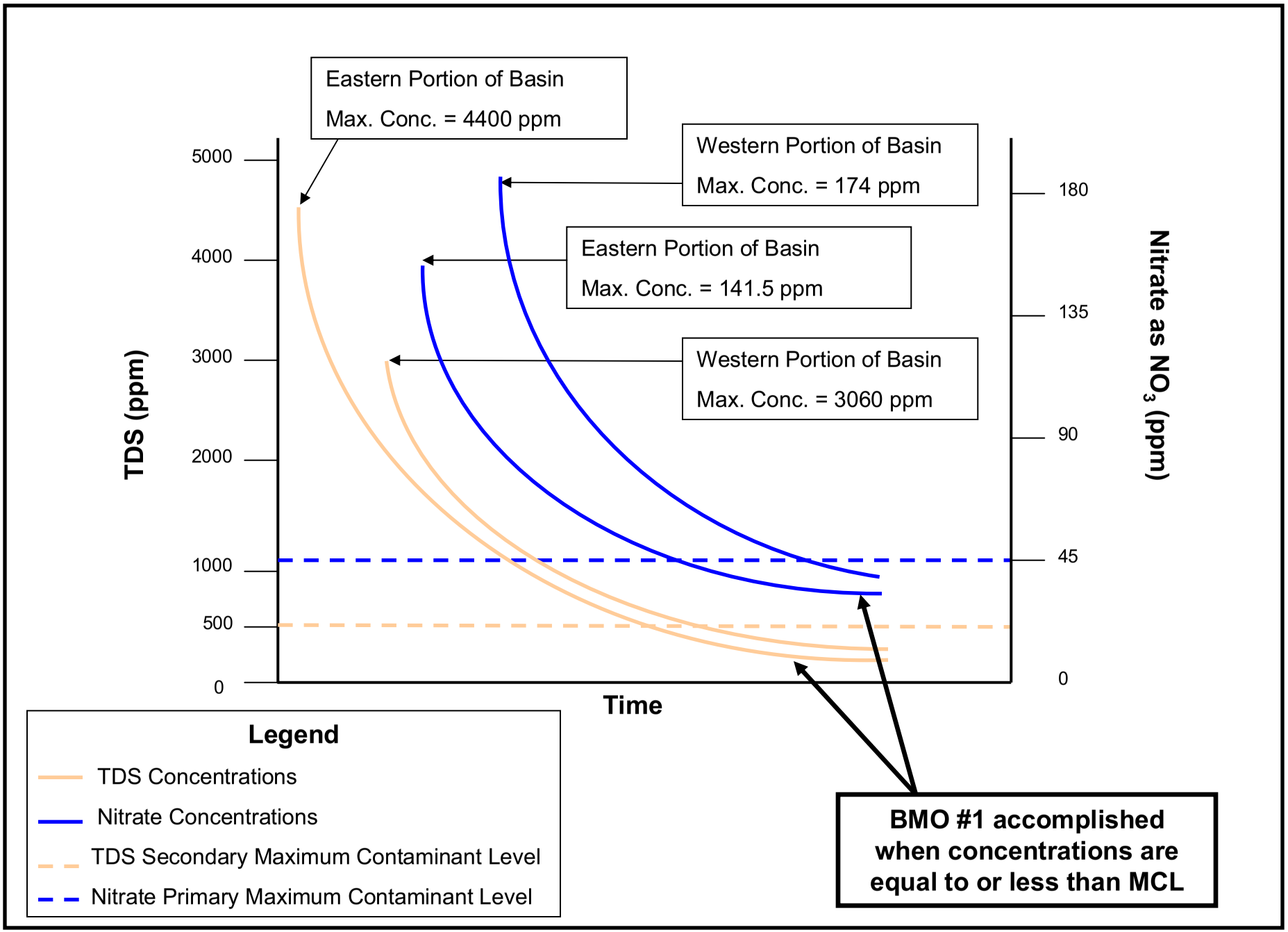


Figure 3-2 – Desired Outcome of BMO #1

3.2.2 BMO#2 - Sustain a Safe, Reliable Local Groundwater Supply

The intent of BMO#2 is to sustain a safe and reliable local groundwater supply for existing and future groundwater uses.

Background

As described in the Vision Plan for San Pasqual basin, San Diego has recognized that the San Pasqual Valley is one of the gems of San Diego County and the agricultural industry is at the foundation of the Valley's character. Specifically, the Vision Plan states that the City is committed to "Preserve, promote, and sustain agricultural uses – to make certain that San Diego's only agricultural area remains viable." Furthermore, the intent of this BMO is in line with the Council Policy 600-4 goal of maintaining the capacity of the basin ultimately to ensure that his invaluable asset is not compromised.

Water users in the basin rely almost entirely on groundwater. As a result of the basin's relatively small size, an imbalance of groundwater pumping to recharge can cause fairly rapid groundwater elevation fluctuations. For example, as described in Section 2, historic records show that groundwater elevations have declined up to 20 feet in a single year and have rebounded at even quicker rates. For this reason, in successive drought years the basin has and may continue to see large declines in groundwater elevations.

Methods/Approach

In order to meet this BMO, groundwater elevations will need to be stabilized within a safe pumping level range as not to present undo risk to users by dewatering wells, degrading groundwater quality, and adding cost to pumping groundwater from lower elevations. As most of the natural yield within the basin is currently utilized by agricultural pumpers, therefore increases in pumping for municipal supply would need to be offset by artificial recharge of the basin to prevent groundwater overdraft. San Diego will collect and analyze monitoring data to support a sustainable reliable local groundwater supply. The use of new and previous collected data will be the basis of the development of a conjunctive use project that outlines an operating groundwater elevation range.

Desired Outcome

As a conjunctive use program relies on the availability of imported water and groundwater during different hydrologic years, full implementation of a program may result in a short term drawdown in groundwater elevations below previous historical levels (this is a result of additional groundwater extraction during the drier and driest years). This BMO will be met when an operating range for groundwater elevations has been developed as part of a conjunctive use program that define upper and lower groundwater elevation thresholds for specific areas in that basin that will minimize impacts as stated above.

3.2.3 BMO#3 - Reduce Dependence on Imported water

The intent of this BMO is to reduce San Diego's dependence on imported water by utilizing groundwater stored within the basin as part of a potential future conjunctive use project.

Background

Reduced dependence on imported water is part of San Diego's LRWRP water supply vision. This vision includes developing potential groundwater resources and storage capacity, combined with surface water management strategies to meet overall water supply and resource management objectives.

Methods/Approach

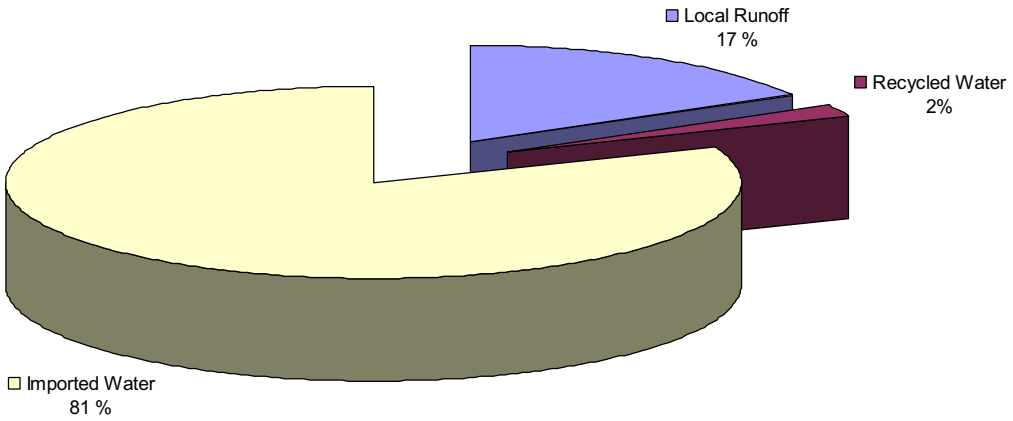
Specifically within the basin, San Diego plans to pursue partnership opportunities with other water purveyors and municipalities to seek out projects and grant opportunities to develop large scale water management/development projects. Specifically within the basin, San Diego plans to investigate conjunctive use opportunities to provide increased local supply.

Desired Outcome

This BMO will be met when San Diego decreases its dependency on imported water by implementing technically, economically and environmentally feasible water supply projects in the basin. As illustrated on **Figure 3-3**, San Diego's current estimates indicate that the 2030 goal is to have 4% of their entire water supply met from "future supplies," a

combination of desalination, surface storage, water transfers, and groundwater production from conjunctive use. As illustrated on **Figure 3-4**, San Diego's current estimates indicate that the operational yield of the basin could in increased by 10,000 to 15,000 AFY through a combination of conjunctive use on the east side of the basin and groundwater desalination on the west side.

San Diego Water Department
Water Supply Portfolio
CY 2005 - Actual



San Diego Water Department
Water Supply Portfolio
2030 - Projected

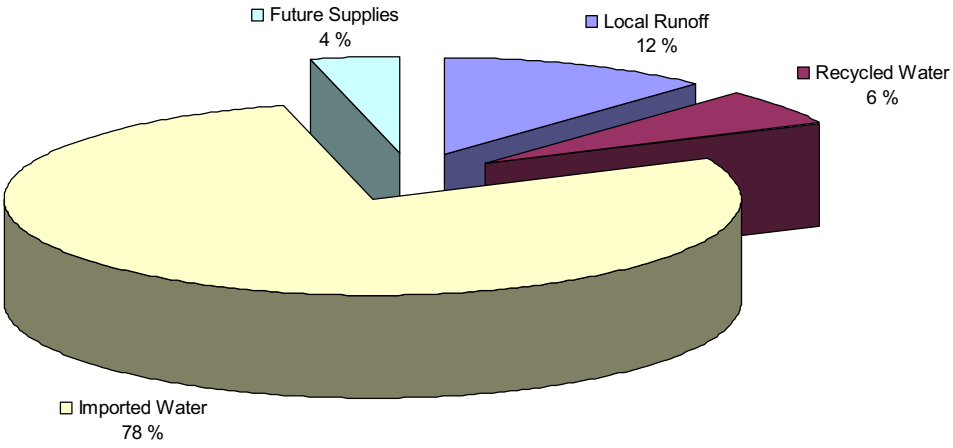


Figure 3-3 – City of San Diego 2005 Actual and 2030 Projected Water Supply Portfolio

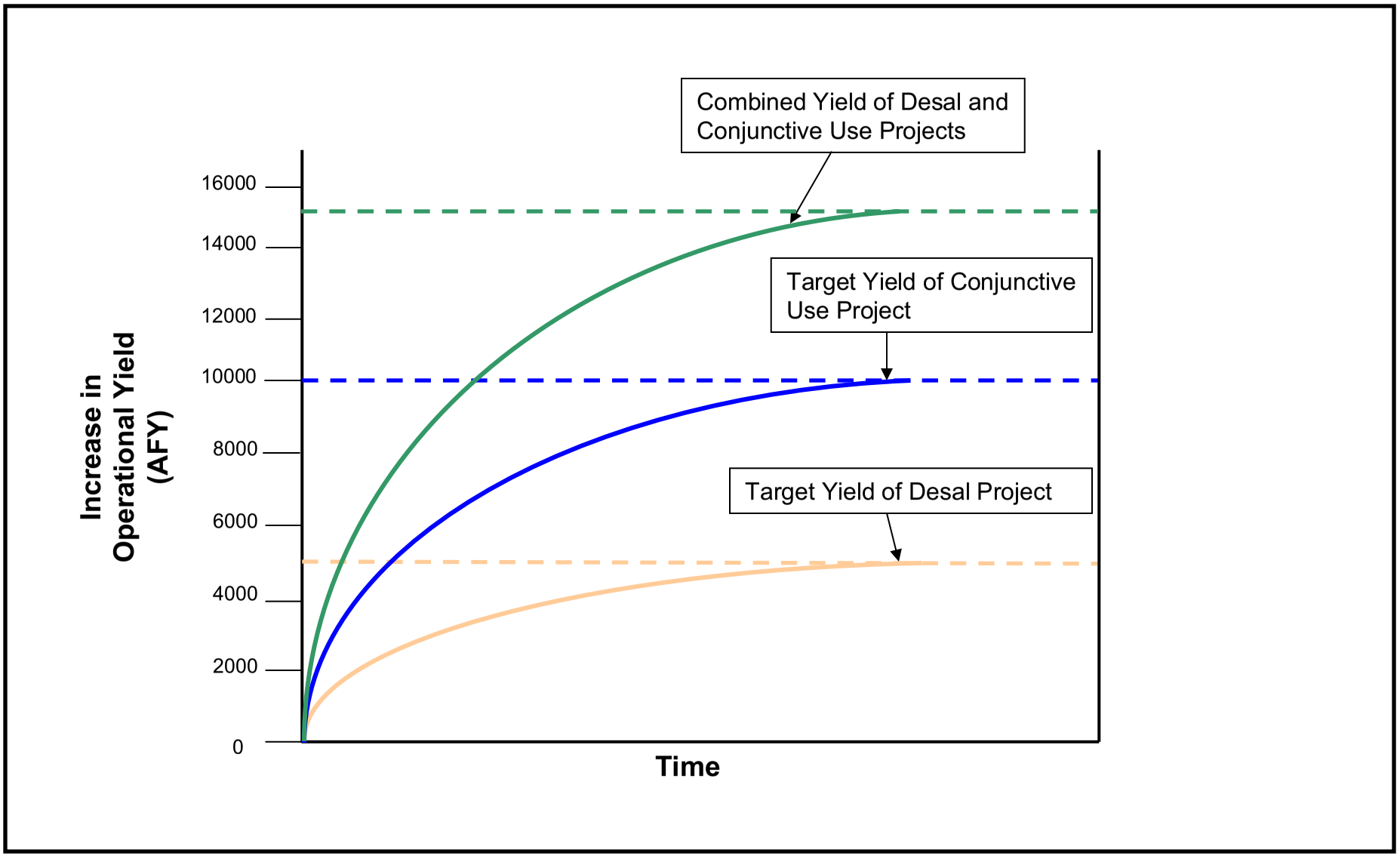


Figure 3-4 - Target Increase in Operational Yield

3.2.4 BMO#4 – Improve Understanding of Groundwater Elevations, Basin Yield and Hydrogeology

The intent of this BMO is to improve the general understanding of the basin specifically related to groundwater elevations, yield and hydrogeology.

Background

A solid understanding of groundwater elevation, seasonal fluctuations and response to pumping, existing basin yield and how groundwater is stored and transmitted through the basin is critical for meeting the other four BMOs outlined within this SPGMP. As provided in Section 2, San Diego has documented the current basin understanding by reporting on previously collected data related to well construction, groundwater elevation and quality, surface water quantity and quality, and borehole lithology.

Methods/Approach

In order to meet this objective, San Diego has developed a revised monitoring and reporting program to be implemented through the adoption of this GMP. In addition to monitoring, San Diego is committed to the collection of new data through the construction and testing of new exploratory borings and production wells in the basin and groundwater modeling efforts. The location and number of wells will be evaluated in future studies. This new information along with the monitoring data will increase the understanding of the physical conditions in the basin and allow for improved yield estimates.

Desired Outcome

This BMO will be met when San Diego has further analyzed seasonal groundwater elevation fluctuations, responses to pumping, and has quantified potential hydrogeologic connections between groundwater and surface water, existing pumping wells, and between alluvium and underlying fractured bedrock.

3.2.5 BMO#5 – Partner with Agricultural and Residential Communities to Continue to Improve Implementation of Best Management Practices.

The intent of this BMO is to partner with agricultural and residential communities to continue to improve implementation of land use best management practices (BMPs).

Background

The basin's groundwater quality, natural habitat, and general rural character can be sustained and improved when agricultural and residential communities implement the use of BMPs. Years of varied land use throughout the basin and in areas tributary to the basin have resulted in degradation of groundwater quality.

Methods/Approach

In order to meet this BMO, San Diego intends to partner with agricultural and residential communities in the basin and engage other agencies outside of the basin to consider improved standards. San Diego believes that it is mutually beneficial to work toward a collaborative solution. For this reason, similar to other BMOs, results from monitoring and analyzing groundwater quality will assist in efforts to minimize the causes of groundwater quality degradation. San Diego will review current and past land use practices to determine if adverse impacts to groundwater quality indicate contamination. If correlations between land use and groundwater contamination are observed, then San Diego will implement or encourage the implementation of BMPs. In rare cases of high levels of contamination, it is anticipated that San Diego will report poor land use practices to enforcement agencies. Enforcement agencies may utilize regulatory programs to safeguard the basin quality.

Desired Outcome

As described in San Diego's Vision Plan for San Pasqual and Council Policy 600-45, San Diego will work toward protecting and enhancing groundwater quality for the benefit of basin groundwater uses. This BMO will be met when San Diego and basin stakeholders identify and implement BMPs to protect the groundwater quality of the San Pasqual Valley.

3.3 SPGMP COMPONENTS

Table 1-3 lists a variety of components that are required, recommended and voluntary per CWC § 10750, and DWR Bulletin 118 (2003). For the purpose of the SPGMP, the individual components listed on**Table 1-3** have been grouped into five broad component categories as listed below:

1) Stakeholder involvement,

2) Monitoring program,

3) Groundwater resource protection,

4) Groundwater sustainability, and

5) Planning integration.

Each of the five component categories listed above are presented in detail in Section 3.5. For each component category, San Diego developed sets of management actions tailored to meet the BMOs. A table of the draft management actions and how they relate to the BMOs and the Public Concerns was prepared. The Public Concerns about the San Pasqual groundwater basin were gathered and reviewed at each of the four PAC meetings. Draft management actions were presented to the PAC members on January 25, 2007. As a result of this public review process management actions were finalized. The following sections provide a more detailed description of each component category and a listing of management actions within each component category.

3.4 COMPONENT CATEGORY 1: STAKEHOLDER INVOLVEMENT

The management actions taken by San Diego in implementing this GMP will impact a broad range of individuals and agencies that have a stake in the successful management of the basin. Stakeholders include: lessees, agricultural, or agricultural-residential private well owners, state and federal water resource agencies. To address the needs of all the stakeholders, this SPGMP pursues several means of achieving broader involvement in the management of the basin; These include: (1) involving members of the public; 2) involving other agencies within and adjacent to the basin; (3) developing relationships with state and federal water agencies; and, (4) pursuing a variety of partnerships to achieve the BMOs. Each of these is discussed further below.

3.4.1 Involving the Public

The Water Code requires that the public be involved during the preparation of the GMP. These requirements consist of "providing a written statement to the public describing the manner in which interested parties may participate in developing the GMP" which may include appointing a technical advisory committee (Water Code 10753.4). In the case of the SPGMP effort San Diego developed a Public Advisory Committee (PAC) to facilitate public involvement. The DWR recommends including a plan to "involve other agencies

that enables the local agency to work cooperatively with other public entities whose service area or boundary overlies the groundwater basin." In addition, DWR suggests establishing an advisory committee for the following reasons:

- To bring a variety of perspectives to the management team,
- To provide anecdotal information and input based on previous investigations and on-going data collection efforts,
- To provide focus on the specifics of groundwater management without being distracted by the operational activities of the managing entity,
- To reduce future conflicts that could arise if some parties are negatively impacted by certain groundwater management decisions, and
- To gain the confidence of the local constituency by providing the opportunity for interested parties to participate in the management process.

The DWR does not provide any more guidance because each GMP and stakeholder process is case specific. For the SPGMP, San Diego (as the owner of the land in San Pasqual), decided to engage in a series of public outreach meetings to inform and gauge specific stakeholder group's interest and involvement in the SPGMP. The stakeholders engaged as part of this outreach are summarized in the Public Outreach Plan included in this SPGMP as **Appendix G**. San Diego created a PAC to gather input from the lessees and other stakeholders in the basin or outside the basin. San Diego also decided to host two open houses during the course of the project to allow the public to ask questions and comment on the various aspects of the documents presented. Below is a description of the activities performed and the information presented at each PAC meeting and each open house.

PAC Meeting #1

1) Explained what a GMP is and why San Diego is preparing one. Presented an overview of the San Pasqual groundwater basin, and provided a general synopsis on the fundamentals of groundwater hydrology.

2) Reviewed the PAC Mission Statement and meeting schedule. Asked if PAC members can help gather information about the basin and explained what is needed.

In addition, San Diego will visit properties in the valley to verify or gather information about wells and to ask lessees and others to provide additional information.

3) Asked the PAC for input on groundwater management issues they would like to see addressed in the GMP.

PAC Meeting #2

1) Presented the Draft Goal statement that was prepared by the project team.

2) Reviewed the groundwater management issues identified at the previous PAC meeting, and added additional ones.

3) Presented the Draft BMOs and explained how they will address the concerns expressed in the first meeting by PAC members.

4) Asked the PAC to provide additional input regarding the Draft BMOs, and prioritize them.

Open House #1

1) Presented information about the GMP preparation.

2) Presented the Draft Goal statement.

3) Presented the Draft BMOs.

4) Presented general information on the fundamental of groundwater hydrology.

5) Presented a map of the valley and ask for well identification information.

6) Asked the attendees to provide inputs and comments on the material presented.

PAC Meeting #3

1) Reviewed the identified issues and the BMOs.

2) Described “Management Actions” and show how they will implement the BMOs.

3) Asked the PAC for additional input regarding the Management Actions.

PAC #4

1) Reviewed the identified issues and describe how these have been addressed in the GMP. If not addressed, an explanation was provided. **Table 3-1** provides a summary listing of these issues and how they were resolved.

2) Provided an explanation for how PAC comments on the "Management Actions" were addressed.

3) Presented and describe the Draft San Pasqual Groundwater Management Plan.

4) Discussed location and logistics for Open House # 2.

Table 3-1 - Policy Advisory Committee (PAC) - Identified Issues or Concerns

GMP Plan Component		Identified Issue or Concern	Addressed in GMP	Not Purview of GMP	Comment
Stakeholder Involvement	A	Develop local water supplies	x		Addressed in the plan to study conjunctive use storage in the basin. The proposed plan is moving is forward as the City is hiring a consultant to perform this study. The proposed Council Action is June 2007.
	B	Ensure the GMP does not impede agriculture in the region.	x		The purpose of the GMP is to protect the resources for the basin, hence all the users. The plan is managing the resources that will be used by agriculture. The GMP is the framework document that will allow for projects and monitoring that will improve the resources.
	C	Examine the water quality and groundwater level impact of Lake Sutherland to San Pasqual groundwater basin	x		Addressed in monitoring program
	D	Work with the existing habitat plan and river park plan.	x		We included representatives of the group that prepared these plans in our PAC meetings and we will continue to reach out to them for future GW improvement projects. These representatives have had opportunities to represent their stakeholder group.
	E	Define the costs of implementing the GMP to the residents and farms in the valley?	x		The City will implement the GMP. The cost of the implementation will be born by the City. There will be no cost of implementation to the residents in the valley.
	F	Include the San Dieguito watershed plan in the analysis.	x		Some of the GMP maps include the entire watershed. The monitoring plan addressed monitoring of watershed tributaries in the San Pasqual basin..

GMP Plan Component		Identified Issue or Concern	Addressed in GMP	Not Purview of GMP	Comment
	G	Rejuvenate groundwater quality by regeneration of the connection with agricultural land.	x		Water quality monitoring is included in the monitoring plan.
Monitoring Program and Basin Understanding	**H**	Establish a safe yield/water budget for the valley	x		The GMP summarized existing water budget data, identified data gaps. A new water budget maybe prepared during the implementation of planned groundwater projects
	I	Determine the cause of the increase in salinity in groundwater over time. Determine what can be done to remedy this.	x		As the monitoring plan is implemented additional data will be acquired providing additional information on salinity. The salt loading maybe controlled in the future through potential desalination and conjunctive use storage projects.
	J	Monitor water quality and soil/sediment in Lake Hodges		x	The monitoring plan addresses water quality but does not address sediments and soil. Water quality in Lake Hodges is monitored by the City and other entities.
	K	Are metered wells an option to monitor water levels and water quality? Who would pay for this and will San Pasqual Academy be included?		x	It is not addressed in the GMP. The GMP is silent on meters but the monitoring plan addresses monitoring wells. This question should be addressed during the implementation of potential projects.
	L	Examine the four wells at the San Pasqual Academy. The Academy has about 500 staff and students living at the facility.		x	Not addressed in the GMP. We will include it in future studies.
	M	Quantify the amount of groundwater in fractured rock in the basin.	x		Identified as an action item in the GMP for future investigation.

GMP Plan Component	Identified Issue or Concern		Addressed in GMP	Not Purview of GMP	Comment
	N	Report polluters from other jurisdictions to appropriate agencies. The GMP needs "some teeth" to it.	x		See Management Actions # 36, 38, 9 and 10
Groundwater Resource Protection	**O**	Quantify salt contribution to the basin from the runoff from the developments inside and outside the basin	x		Addressed in the monitoring plan. Same as above.
	P	Identify source of pollution. Agriculture has traditionally been blamed for the cause of the pollution, but sources may be from the shopping centers and other development in the area that are outside the control of the City of San Diego.	x		Same as above
	Q	Investigate using the City of San Diego's surplus of recycled water in the basin to alleviate water shortages		x	The City already investigated this option as part of their water reuse study. It was not determined to be feasible at that time.

GMP Plan Component	Identified Issue or Concern		Addressed in GMP	Not Purview of GMP	Comment
Groundwater Sustainability	R	Remove of exotic plants from the river.		x	Please see Section 2.5 of this GMP for a description of planning efforts currently underway to eradicate non-native plant species from San Pasqual Valley.
Issue for Other Community Initiatives	S	Correspond with interdepartment/agency about stream course, flood control and channel maintenance	x		

The PAC meeting format allowed for a transparent process and for valuable input from PAC members and the public to be incorporated into this SPGMP.

In preparing the SPGMP, San Diego has filed four separate notices in the North County Times and The Daily Transcript (**Appendix H**). A notice of intent to prepare a GMP was published in the San Diego Daily Transcript on September 26, 2006. In accordance with CWC § 10753.2, a notice of intent to adopt a resolution to prepare a GMP was adopted on October 10, 2006. Upon adoption of the resolution, the text of the resolution was published in the San Diego Daily Transcript and North County Times on December 22, 2006. San Diego also provided a public comment period on the draft SPGMP, provided notice and held a meeting for the public comment on the SPGMP October 30, 2007. The final SPGMP was adopted on November 13, 2007.

San Diego has posted on its website http://www.sandiego.gov/water a copy of the SPGMP. San Diego will continue to use its website to distribute information on SPGMP implementation activities to the public.

Actions. San Diego will take the following actions related to involving the public:

- Update Public Outreach Plan every five years.
- Implement Public Outreach Plan developed for the SPGMP.
- Provide annual briefings to the PAC and invite stakeholders listed in **Appendix G**, including domestic and agricultural groundwater users, on San Pasqual GMP implementation progress.
- Create a new GMP website or use an existing San Diego website to display SPGMP information. Relevant website content may include outreach material, groundwater levels, groundwater quality and project updates.
- Annually review list of stakeholders and update as necessary.

3.4.2 Involving Other Agencies Within and Adjacent to the San Pasqual Basin

Figure 1-3 shows adjacent water agencies and municipalities within the greater San Diego county area. A description of these immediately adjacent agencies is provided in Section 1.5.2. Involving adjacent agencies in implementing this SPGMP is important to San Diego. These agencies include the Cities of Escondido, Ramona, Rancho Bernardo and Poway and the County of San Diego as each have the authority to establish land use policies within the San Dieguito watershed. Land use practices within the San Dieguito watershed influences the health of the basin. For this reason, San Diego plans to conduct the following actions specifically related to working with these agencies to improve standards and monitoring to protect basin water quality and periodically provide relevant basin reports.

Actions. San Diego will take the following actions:

- Contact the land use authorities in the watershed such as the Cities of Escondido, Ramona, Rancho Bernardo, Poway, and the County of San Diego, to determine interests in considering improved standard to protect water quality.

- Monitor and review new development proposals and projects within the watershed to ensure that these proposals incorporate appropriate measures to protect water quality and water quantity, as described in the SDWMP.

- Provide copies of the adopted SPGMP and subsequent bi-annual state of the basin assessments to representatives from the City of Escondido, Ramona, Rancho Bernardo, San Diego County Water Authority and the County of San Diego and other interested parties.

3.4.3 Developing Relationships with Local, State, and Federal Agencies

Working relationships between San Diego and local, state, and federal regulatory agencies are critical in developing and implementing the various groundwater management strategies and actions detailed in this SPGMP. This City will work toward further establishing points of contact with the agencies responsible for resource management within the basin and greater San Dieguito watershed area. Relationships will help San Diego identify those who can inform the City of new commercial,

agricultural, or development projects in watershed, enabling San Diego to review and comment on these projects. In addition, the City will be able to ensure that non compliance fees are returned to San Diego to fund water resource improvement projects in the basin.

Actions. San Diego will take the following actions:

- Partner with local, state and federal regulatory agencies to ensure that non-compliance fees are returned to the City of San Diego to fund water resource improvement programs in San Pasqual Basin.

- Establish a point of contact within local, state, and federal regulatory agencies that have responsibility for resource management within San Pasqual Basin. Please see list provided in **Appendix G**. Important resource agencies include (but are not limited to) the California Department of Water Resources (DWR), the County Department of Environmental Health (DEH), Regional Water Quality Control Board (RWQCB), Department of Health Services (DHS), U.S. Fish and Wildlife Service, California Dept of Fish and Game, San Dieguito River Park Joint Powers Authority (JPA), U.S. Department of Agriculture and the Forest Service.

- Establish a formal process whereby jurisdictions in the watershed will notify the Water Department of any new residential, commercial, or agricultural development proposals or projects in the watershed; thus providing an opportunity for the Water Department to review and comment on the development, and verify that measures to protect water quality, as described in the SDWMP are being incorporated into the designs.

3.4.4 Pursuing Partnership Opportunities

This City is committed to facilitating partnership arrangements at the local, state, and federal levels. Over a 60 year plus period, water agencies and municipalities within the County have been able to obtain 90% of their water supply from the San Diego County Water Authority (SDCWA). The SDCWA, San Diego and other local leaders have made great strides toward regional planning and collaboration on water issues. Through SDCWA's Facilities Master Plan, Groundwater Storage and Recovery studies and projects have been identified in the County.

San Diego intends to use a similar approach by forming partnerships to implement the City's LRWRP Plan goals including the potential developing of a conjunctive use project in the San Pasqual Basin. While the facilities necessary to implement, develop and expand conjunctive use programs in the SPGMP area have not been fully identified, the potential exists to develop and expand facilities to achieve broader local and regional and statewide benefits. The needed facilities, however, would require substantial resources. To investigate opportunities would likely require resources provided through partnerships with potential beneficiaries. For this reason, the City will track and develop grant applications to fund some SPGMP actions and projects within and related to the basin.

Actions. San Diego will take the following actions:

- Continue to promote partnerships with water purveyors and municipalities to achieve regional water supply reliability for the City of San Diego in San Pasqual Basin.

- Continue to track and apply for grant opportunities to fund GMP activities and local water management/development projects.

3.5 COMPONENTS CATEGORY 2: MONITORING PROGRAM (REQUIRED)

At the heart of this SPGMP is a monitoring program. Data collected under this program allows San Diego to better assess the current condition of the basin and document responses in the basin as a result of future management actions. The program includes monitoring groundwater elevations and stream flows, groundwater and surface water quality, assessing the potential for land surface subsidence resulting from groundwater extraction, and developing a better understanding of the interaction between surface water and groundwater. Also important is the establishment of monitoring protocols to ensure the accuracy and consistency of data collected.

3.5.1 Groundwater Elevation Monitoring

San Diego does not currently collect and record groundwater elevation data from the basin. **Figure 3-5** shows the locations of 18 wells to be included in a semi-annual (spring and fall) groundwater level monitoring program. Collection of groundwater levels at these locations will improve the understanding of groundwater storage conditions within San Pasqual Basin before and after the pumping season each year. The wells selected on

Figure 3-5, are to provide uniform geographic coverage throughout the approximately 15.5 square mile SPGMP area.

Protocols to be followed by City staff or their consultants in collecting groundwater measurements are included in **Appendix I** and discussed in Section 3.6.5. In addition, as described in Section 3.6.8, groundwater level data will be uploaded to the DMS as described in Section 3.6.9.

Actions. San Diego will implement the following actions:

- Identify and select production/monitoring well locations for installation of groundwater elevation data loggers.
- Collect and evaluate groundwater elevation data from existing production and monitoring wells.

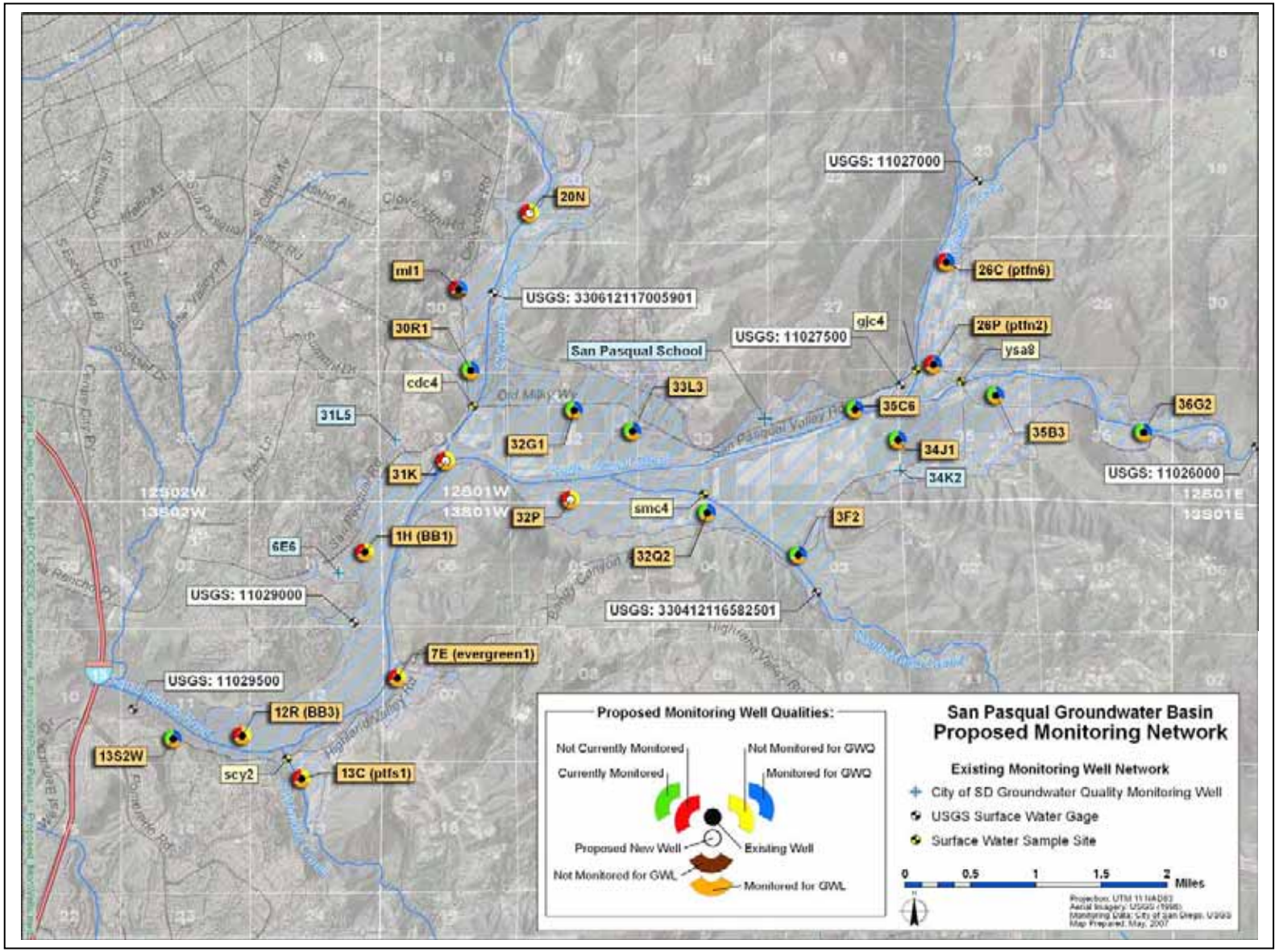


Figure 3-5 - Proposed Groundwater Monitoring Network

3.5.2 Groundwater Production

San Diego does not currently collect and record groundwater production information from their leases. Currently, total groundwater pumping in the basin is estimated based on evaluating land use and estimating consumptive use. In the future, it will be important to better understand the locations of existing active groundwater production wells in relation to proposed groundwater improvement facilities (i.e. recharge wells, recharge basins, extraction wells). This information will be required to complete CEQA documentation during the planning and design stages of future projects in order to evaluate cumulative impacts of project pumping and third party impacts.

Actions: San Diego will implement the following actions:

1) As a part of any future conjunctive use or other related project initiative, survey leases to identify locations of active production wells used for irrigation and domestic purposes.

2) As a part of any future conjunctive use or other related project initiative, estimate current and historic pumping from these wells based on evaluation of energy records and other available information and include in bi-annual "State of the Basin" reports.

3.5.3 Surface Water Flow Monitoring

For surface water flow, San Diego contracts with the USGS to maintain stream flow gauging stations at locations shown on **Figure 3-5**. Stream flow data for these locations has been archived in the DMS and are described in Section 2. San Diego will continue to contract with the USGS to maintain stream flow gauging stations at locations shown on **Figure 3-5**. Stream flow data for these locations will continue to be archived in the DMS as described in **Section 3.6.8**.

Actions. San Diego will implement the following actions:

- Continue to collect, evaluate and archive stream flow data from the creeks and streams entering and exiting the basin.

3.5.4 Groundwater Quality Monitoring

Figure 3-5 indicates that San Diego is currently collecting and analyzing groundwater quality samples from 10 wells in the basin. These samples are collected and analyzed quarterly for the following constituents:

- Volatile Organic Compounds,
- Semi-Volatile Organic Compounds, and
- General Minerals

Analytical results for these constituents for the period 1991 through 2006 have been archived in San Diego's DMS, described in Section 2.

In addition to the wells currently being sampled, San Diego will collect and analyze groundwater samples from four (4) additional locations:

- Upper reach of the San Dieguito River portion of the basin (i.e. well 30A). Purpose of this new location is to characterize the quality of groundwater in the upper reach of the basin. This data will be compared to groundwater quality from well 30R to better understand how groundwater quality changes within the San Dieguito portion of the basin.
- Mouth of Guejito Creek portion of the basin (i.e. well 26P).

- Upper reach of Guejito Creek portion of the basin. This data will be compared to groundwater quality from well 26P to better understand how groundwater quality changes within the Guejito Creek portion of the basin.

- Eastern end of the basin (i.e. Section 36G3). To improve the understanding of groundwater quality conditions at the far eastern end of the basin.

Groundwater samples will be collected semi-annually (spring and fall) from the 14 wells shown on **Figure 3-5** and analyzed for the following constituents:

- Volatile Organic Compounds,

- Semi-Volatile Organic Compounds (ML/EPA Method 525.2),

- Pesticides and Herbicides,

- General Minerals, and

- Stable Isotopes (a one time sampling event to improve understanding related to groundwater age and sources of recharge)

Protocols to be followed by City staff or their consultants in collecting groundwater samples are included in **Appendix I** of this GMP. Analytical results will be uploaded to the DMS.

The SDWMP identifies a number of actions associated with the goal to protect and enhance water quality in the watershed. The actions were written to reduce impervious surfaces and hardscape, reduce ongoing discharge impairments, evaluate and implement land-use BMPs, reduce erosion, and reduce litter. A detailed list of actions can be found in the SDWMP (Weston Solutions, 2006).

Actions. The following actions will be taken by San Diego to monitor and manage groundwater quality:

- Identify and select production/monitoring well locations for installation of groundwater quality data loggers.

- Continue to collect and evaluate relevant existing production and monitoring well groundwater quality data and further identify water quality constituents of concern.

- Evaluate the potential mobilization of water quality contaminants as a result of rising groundwater groundwater elevations in response to implementation of a conjunctive use within the groundwater basin.

- Periodically collaborate with the U.S. Geological Survey (USGS) and the State Water Resources Control Board (SWRCB) to include monitoring results from the Groundwater Ambient Monitoring and Assessment (GAMA) program in updates to the bi-annual state of the basin assessment.

3.5.5 Surface Water Quality Monitoring

For surface water quality, samples are currently collected quarterly from five (5) locations shown on **Figure 3-5** and analyzed for:

- Organics (data for all the synthetic organic compounds that are regulated in drinking water)

- Bacteria (coliform bacteria and associated bacteria)

- Inorganics (same as groundwater)

Flow in creeks is seasonal and so year round sampling is not possible, however, precipitation runoff are occasionally collected from the following locations.

- Guejito Creek

- Santa Ysabel Creek

- Santa Maria Creek

Urban water runoff plus rainfall runoff is currently monitored year round at the following locations:

- Kit Carson Creek

- Cloverdale Creek

- Sycamore Creek

Changes in the location, frequency of sampling are not proposed at this time. San Diego will sample for stable isotopes (a one time sampling event) to better understanding surface water groundwater interaction. Surface water quality data will be added to the DMS. Protocols to be followed by City staff or their consultants in collecting groundwater measurements are included in **Appendix I** of this GMP. Groundwater level data will be uploaded to the DMS.

Actions. The following actions will be taken by San Diego:

- Archive the analytical results of surface water sampling in the SPGMS
- Collect and analyze surface water samples for stable isotopes to better understand surface water/groundwater interaction.

3.5.6 Land Surface Elevation Monitoring

Monitoring inelastic subsidence of the land surface resulting from compaction of underlying formations affected by head (groundwater elevation) decline is of importance to the DWR and water managers throughout the state. During a typical pumping season, changes in land surface elevation can be observed as a result of both elastic and inelastic subsidence in the underlying basin. Elastic subsidence results from the reduction of pore fluid pressures in the aquifer and typically rebounds when pumping ceases or when groundwater is otherwise recharged resulting in increased pore fluid pressure. Inelastic subsidence occurs when pore fluid pressures decline to the point that aquitard (a clay bed of an aquifer system) sediments collapse resulting in permanent compaction and reduced ability to store water in that portion of the aquifer.

Based on the available San Pasqual Basin geologic and lithologic data as described in Section 2, the basin is comprised of fairly coarse grained alluvial deposits which range in thickness from only 120 to 200 feet. Based on this data, no evidence of laterally extensive confining units was encountered, which would exhibit the potential for inelastic subsidence.

In summary, given the relatively small size of the San Pasqual Basin and thickness and composition of alluvial material, in-elastic land surface subsidence is considered very unlikely. For these reasons, San Diego does not intend to install and maintain subsidence

monitoring points in the basin. However, if new evidence is discovered in the future indicating that subsidence warrants further investigation, San Diego will reconsider subsidence monitoring.

3.5.7 Surface Water Groundwater Interaction Monitoring

The interaction between groundwater and surface water has not been extensively evaluated within the basin. The primary occurrence of surface water and groundwater interaction exists at Lake Hodges. This occurs as a result of underflow from the basin to Lake Hodges. The existence of phreatophytes (plants that obtain water from a permanent ground supply or from the water table) and other sensitive species and habitats in around Lake Hodges necessitates the need for active monitoring of this interaction:

Actions. San Diego will pursue actions to better understand the relationship between surface and groundwater in the SPGMP area, including:

- Regularly summarize groundwater and Lake Hodges water quality in the bi-annual state of the basin assessments.
- Summarize surface water quality data from existing City of San Diego monitoring points in the bi-annual State of the Basin assessments.

3.5.8 Protocols for the Collection of Groundwater Data

Through the work completed as part of the SPGMP, MWH has evaluated the accuracy and reliability of groundwater data collected by San Diego, U.S. Geological Survey, California Department of Water Resources, and County. The evaluation indicated a significant range of techniques, frequencies and documentation methods for the collection of groundwater elevations and quality data. Although the groundwater data collection protocol may be adequate to meet the needs of individual agencies, the lack of consistency yields an incomplete picture of basin-wide groundwater conditions. In order for San Diego to ensure they collect the highest quality data which is consistent with other agencies, Standard Operation Procedures (SOPs) for the collection of future data are provided in **Appendix I**. These SOPs will be reviewed periodically and modified to reflect new data collection techniques and procedures as necessary.

Actions. To improve the comparability, reliability and accuracy of groundwater data, San Diego will take the following actions:

- Determine monitoring network adequacy and periodically review and expand as appropriate to meet the needs of the GMP on a 5-year frequency or on a special project need basis.

- Establish protocols for methods and frequency of collection, storing, and disseminating data. These protocols will be documented in **Appendix I** of the SPGMP and may be updated in the bi-annual state of the basin assessments.

3.5.9 Groundwater Reporting

A bi-annual state of the basin assessment is an essential document that will provide detailed information to stakeholders and the general public on the current status of the San Pasqual basin. This report will include the following:

- Description of current basin conditions which may include:
  - Updated land use information when available from DWR or based on information provided by leases,
  - An updated water budget,
  - Characterization and evaluation of groundwater and surface water conditions,
  - Summary of data collection methods and frequencies, and
  - Identification of water quality constituents of concern;
- Implementation status of SPGMP action items and other groundwater projects; and
- Conclusions and recommendations.

In order to ensure that San Diego continues to report on the salient information, actions and BMOs will be reviewed on a bi-annual basis to coincide with the state of the basin assessment. As suggested changes to actions and the BMOs will be provided in the assessment, it will be considered a living document.

San Diego will also evaluate the need to update a groundwater numerical model. It is likely that a fate and transport model for the basin will be prepared as part of a future conjunctive use program. The modeling objectives will likely include the following:

- To better understand the basin water budget;
- To provide an estimate of yield; and
- To evaluate various recharge and extraction scenarios, specifically:
    - Changes in groundwater elevations and impacts on existing groundwater users and the environment (phreatophytes on west side of basin).

Actions. To analyze and document basin conditions, San Diego will take the following actions:

- Determine the need for a numerical groundwater model and re-evaluate the need during development of the bi-annual state of the basin assessment. If deemed necessary, provide resources for maintaining, updating and utilizing a groundwater model. A potential application of a numerical model may be to assist in the development of a basin wide salt balance.
- Develop and present a bi-annual state of the basin assessment
- Review and update of GMP action items bi-annually. This information may be included in the bi-annual state of the basin reports.

3.5.10 Groundwater Modeling

San Diego plans to develop a numerical groundwater model for the San Pasqual Valley that is capabe of:

- Cross-checking existing information on stream flow, groundwater level, pumping, aquifer parameters and water quality provided in Chapter 2 of the GMP and the SPDMS
- Simulating the groundwater hydraulic effects (flow amounts and gradient) of various operational scenarios of spreading and withdrawal at dedicated wells.

- Assisting in evaluation water quality impacts of mixing of imported water and native groundwater through the use of particle tracking and "zone of influence" evaluations.

A preliminary steady-state groundwater flow model will be constructed and calibrated to simulate recent or near-recent conditions in which the basin is judged to be in a relative steady state condition. The domain of the model will cover the entire alluvial portion of the basin and extend west to Lake Hodges. San Diego will most likly use the MODFLOW groundwater model developed by the U.S. Geological Survey with the Groundwater Modeling System (GMS) pre- and post processor.

The groundwater flow model will be developed first using information provided in Chapter 2 of the GMP and the SPDMS, without the collection of new field data. It is anticipated that several simplifying assumptions will need to be made where data is lacking, as outlined in the modeling strategy document and refined during model calibration.

Based on the initial model, the need for collection of additional field data will be evaluated. After collection of this data, it is anticipated that improvements in the numerical model can be made based on the knowledge the field data provides. These model improvements may be performed in a second phase of the modeling efforts.

3.5.11 Evaluate Bedrock Underlying San Pasqual Valley

During a PAC meeting anecdotal information was provided indicating that a few wells may draw groundwater from the fractured bedrock system. For this reason, San Diego has developed a specific action designed to understand the underlying bedrock and how the transmission and storage of water relates to the overlying alluvial aquifer.

Action. To obtain an improved basin understanding related to the interaction of the bedrock and alluvial water bearing systems, San Diego will take the following action:

- Review well construction information to identify groups of wells screened within alluvial formations and groups screened within underlying bedrock. If information is available, evaluate grouped well data (quality and elevations) to determine if groundwater within the bedrock formation is a viable groundwater water supply resource.

3.5.12 Data Management System

In order for San Diego to achieve its goal of sustaining the groundwater resource within the basin, it was essential to develop a data storage and analysis tool, or DMS. The DMS was developed by MWH under contract with the USACE. Other local sponsors included SGA and its member agencies, DWR, and SCWA.

The DMS is a public domain application developed in a Microsoft Visual Basic environment and is linked to a SQL database containing North American Basin purveyor data. The DMS provides the end-user with ready access to both enter and retrieve data in either tabular or graphical formats. Security features in the DMS allow for access restrictions based on a variety of user permission levels. Data in the DMS include:

- Well construction details.
- Known locations of groundwater contamination and potentially contaminating activities.
- Long-term monitoring data on:
  - Monthly extraction volumes.
  - Groundwater elevations.
  - Water quality.
- Aquifer characteristics based on well completion reports.

The DMS allows for the viewing of regional trends in groundwater elevations and quality not previously available to San Diego. The DMS has the capability of quickly generating well hydrographs and groundwater elevation contour maps using historic groundwater elevations data. The DMS also has the ability to view water quality data for California Code of Regulations Title 22 required constituents as a temporal concentration graph at a single well or any constituent can be plotted with respect to concentration throughout the basin. Presentation of groundwater elevation and quality data in these ways will be useful for making groundwater basin management decisions.

San Diego is currently in the process of inputting all relevant groundwater related data in the DMS. Bi-annual summaries of groundwater monitoring data will be prepared using

the analysis tools in the DMS and presented in the update to the bi-annual basin assessment (see **Section 3.6.6**).

Once the DMS is fully populated and quality-control checked a summary of existing basin conditions will be prepared. From this initial summary analysis will be performed on at least a bi-annual basis to assess the impacts of current and future City management actions on the groundwater system.

Actions. To maintain and improve the usability of the DMS, San Diego will take the following actions:

- Bi-annual updates DMS with future groundwater elevation and quality, well construction and lithology, borehole geophysical and surface water stream gauge data.

Provide City's available resources for maintaining and updating the DMS.

3.6 COMPONENT CATEGORY 3: GROUNDWATER RESOURCES PROTECTION

San Diego considers groundwater protection to be one of the most critical components of ensuring a sustainable groundwater resource. In this SPGMP, resource protection includes both the prevention of contamination from entering the groundwater basin and the remediation of existing contaminants. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas. Containment prevention also includes measures to prevent contamination from human activities as well as contamination from natural substances such as saline water bodies from entering the potable portion of the groundwater system.

3.6.1 Well Construction Policies

San Diego County typically administers well construction policies through a well permitting program for the entire County. San Diego County Department of Environmental Health (DEH) well permitting program is detailed in San Diego County Code of Regulatory Ordinances, Title 6 Health and Sanitation, Division 7 Water and Water Supplies, Chapter 4 Wells, Article 1. General, which define the purpose and intent of the chapter (SEC.67.401.) as:

> *"to provide for the construction, repair and reconstruction of wells to the end that the ground water of this County will not be polluted or contaminated and that water obtained from such wells will be suitable for the purpose for which used and will not jeopardize the health, safety or welfare of the people of this County, and for the destruction of abandoned wells or wells found to be public nuisances to the end that such wells will not cause pollution or contamination of ground water or otherwise jeopardize the health, safety or welfare of the people of this County."*

San Diego County Code of Regulatory Ordinance Article 3. Standards, defines the general standards (SEC.67.420.) and standards for water wells (SEC.67.420.) as:

> *"No person shall construct, repair, reconstruct or destroy any well subject to this Chapter which does not conform to the standards established herein,"*

and

> *"Standards for the construction, repair, reconstruction or destruction of water wells shall be as set forth in Chapter II of State Department of Water Resources Bulletin No. 74-81 and Bulletin No. 74-90 (three copies of which have been filed with the Clerk of the Board of Supervisors of the County of San Diego and marked as Document No. 761185 and Document No. 761185A with the following modifications to Document No. 761185A,"*

respectively.

San Diego County Code of Regulatory ordinance Article 5. Construction, Repair, Reconstruction and Destruction of Wells, specifies the Acts Prohibited (SEC.67.440.) and Permits (SEC.67.441.) as:

> *"No person shall construct, repair, reconstruct or destroy any well unless a written permit has first been obtained from the Director of the Department of Environmental Health as provided in this Chapter, and unless the work done shall conform to the standards specified in this Chapter and all the conditions of the said permit.,"*

and

> *"Applications: Applications for permits shall be made to the Director of the Department of Environmental Health and shall include the following…,"*

respectively.

Multiple permitting requirements are provided as part of the Permits Section (SEC.67.441.) and are available at the following website.

http://www.sdcounty.ca.gov/deh/lwq/sam/wells_chapter_4.html

Actions. San Diego will take the following actions:

- Ensure that future production and monitoring wells are constructed per the County DEH well ordinance and City of San Diego staff understands the proper well construction procedures.

- Inform lessees and other groundwater users who are constructing production and monitoring wells of available information related to water quality concerns to assist with proper well siting. This information may be included on the GMP website.

- Provide lessees and other groundwater users with guidance on the importance and use of exploratory borehole information (lithologic descriptions and geophysical data) in the design and construction of production and monitoring wells. This guidance information may be included on the SPGMP website.

3.6.2 Well Destruction Policies

Similar to the well construction policies, San Diego County typically administers well destruction through their well permitting program. San Diego County DEH's well destruction requirements are also detailed in San Diego County Code of Regulatory Ordinance, Title 6 Health and Sanitation, Division 7 Water and Water Supplies, Chapter 4 Wells. The code articles described in Section 3.7.1 also apply to well destruction. As described in San Diego County Code of Regulatory Ordinance Article 5. Construction, Repair, Reconstruction and Destruction of Wells, Permits (SEC.67.441.), C. Conditions:

> *"Permits shall be issued in compliance with the standards set out in "California Well Standards" Bulletin 74-81 and Bulletin 74-90 and as provided in this Chapter except that such standards shall be inapplicable or modified as expressly provided by the Director of the Department of Environmental Health in such permit upon his finding that such modifications or inapplicability will accomplish the purposes of this ordinance. Permits may also include any other condition or requirement found by the Director of the Department of Environmental Health to be necessary to accomplish the purposes of this Chapter."*

One concern expressed by San Diego is that some abandoned domestic or agricultural wells may not been properly destroyed. For this reason, the City intends to conduct the follow actions utilizing guidance set forth from the DEH well destruction policies.

Actions. San Diego will take the following actions:

- Document well status active, (operational, and currently in use), inactive (not currently being used, but operational, with potential for future use), or abandoned (inoperable, or permanently inactive, with no potential for future use) as part of a well inventory survey completed during the development of the SPGMP. Based on survey results, if wells are classified as inactive, and then resurvey every 5 years to establish current well classification and follow appropriate protocols based on well status change. Abandoned wells, not included in the groundwater monitoring program, should be properly destroyed. Based on survey results, if wells are classified as abandoned, develop phased schedule for well destruction following DWR and/or County DEH standards.

- Ensure that land lessees are provided a copy of the County DEH's code and understanding the proper destruction procedures and support implementation of these procedures. A link to this information shall be provided on the SPGMP website.

- Follow up with the County DEH on the reported abandoned and destroyed wells to confirm the information has been provided to the DWR and vice versa. The City of San Diego will also keep a record of well status in the groundwater DMS.

3.6.3 Protection of Recharge Areas

Numerous studies have evaluated the surface and subsurface geology within basin. Natural recharge of groundwater resources occurs primarily from percolation of irrigation water, infiltration along the creeks and drainages, infiltration of precipitation, and subsurface inflow. Natural recharge rates can be maintained by keeping the major recharge areas free of impervious surfaces. The SDWMP outlines a number of actions focused on reducing the amount of impervious surface and hardscape in the watershed (Weston Solutions, 2006). These actions include increasing cluster development, increasing the use of pervious surfaces during development and redevelopment, constructing parking lots with pervious pavement, creating grassy swales and/or

vegetated areas to treat urban runoff, and performing roadway improvements using vegetated medians, buffers, and/or parkways (Weston Solutions, 2006).

The efficiency of direct recharge through surface spreading, as opposed to natural recharge, is highly related to the infiltration rate of the surficial soil. Based on previous descriptions, the most favorable areas for direct recharge utilizing surface spreading techniques, based on surface and subsurface geology and historical water level measurements are within Tujunga Sands (due to relative high permeability) located approximately in the center of the basin, just south of the Ysabel creek (Greeley and Hansen/HYA, 1993). Other areas along or near natural streams may be good candidates for spreading activities due to the presence of additional exposed Tujunga sands and other subsurface alluvium. Areas where canals, treated water systems, or possibly wastewater treatment plants are nearby may also be good candidates due to the proximity to potential water sources.

Actions. San Diego will take the following action:

- If groundwater quality monitoring data indicate groundwater contamination, review current and past land use practices to determine adverse impacts on groundwater quality. If correlations between land use and groundwater contamination are observed, then implement BMPs or report to appropriate enforcement agency.

3.6.4 Wellhead Protection Measures

As no municipal production wells exist in the basin (as all wells in the basin are for agricultural and self-supplied use) historically wellhead protection measure programs have not been applied within the basin. Identification of wellhead protection areas is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program administered by DHS. DHS set a goal for all public water systems statewide to complete Drinking Water Source Assessments by mid-2003. The goals of the DWSAP Program are provided below:

- Protection and benefit of public water systems of the State;
- Improve drinking water quality and support effective management of water resources;

- Inform communities and drinking water systems of contaminants and possible contaminating activities that may affect drinking water quality or the ability to permit new drinking water sources;
- Encourage a proactive approach to protecting drinking water sources and enable protection activities by communities and drinking water systems;
- Refine and target the monitoring requirements for drinking water sources;
- Focus cleanup and pollution prevention efforts on serious threats to surface and groundwater sources of drinking water;
- Meet federal requirements for establishing wellhead protection and drinking water source assessment programs; and
- Assist in meeting other regulatory requirements.

The three major components required by DHS for completion of an assessment include:

- Delineation of capture zones around source wells;
- Inventory Potential Contaminating Activities (PCAs) within protection areas; and
- Analyze the vulnerability of source wells to PCAs.

Delineation of capture zones includes using groundwater gradient and hydraulic conductivity data to calculate the surface area overlying the portion of the aquifer that contributes water to a well within specified time-of-travel periods. Typically, areas are delineated representing 2-, 5-, and 10-year time-of-travel periods. These protection areas need to be managed to protect the drinking water supply from viral, microbial, and direct chemical contamination.

Inventories of PCAs include identifying potential origins of contamination to the drinking water source and protection areas. PCAs may consist of commercial, industrial, agricultural, and residential sites, or infrastructure sources such as utilities and roads. Depending on the type of source, each PCA is assigned a risk ranking, ranging from “very high” for such sources as gas stations, dry cleaners, and landfills, to “low” for such sources as schools, lakes, and non-irrigated cropland.

Vulnerability analysis includes determining the most significant threats to the quality of the water supply by evaluating PCAs in terms of risk rankings, proximity to wells, and Physical Barrier Effectiveness (PBE). PBE takes into account factors that could limit infiltration of contaminants including type of aquifer, aquifer material (for unconfined aquifers), pathways of contamination, static water conditions, hydraulic head (for confined aquifers), well operation, and well construction. The vulnerability analysis scoring system assigns point values for PCA risk rankings, PCA locations within wellhead protection areas, and well area PBE; the PCAs to which drinking water wells are most vulnerable are apparent once vulnerability scoring is complete.

PCA and capture zone information can be added to the DMS to aid in assessing wellhead protection. The DMS includes a feature that will automatically calculate wellhead protection areas if no data are available or if new well locations are proposed.

Actions. San Diego will take the following actions:

- If a conjunctive use project is implemented, contact groundwater basin managers in other areas of the state for technical advice, effective management practices, and "lessons learned", regarding establishing wellhead protection areas.

3.6.5 Control of the Migration & Remediation of Contaminated Groundwater

Contaminated groundwater within the basin most likely results from agricultural land use and upstream point and non-point urban water runoff. Although actions identified within this section will be applicable to all types of contaminants, San Diego is primarily concerned with basin areas that have elevated levels (exceeding the MCL and RWQCB Basin Objectives) of groundwater qualiconstitutent concentrations. **Figure 2-7** and **Figure 2-9**, illustrate concentrations of TDS and nitrate, respectively, from select wells throughout the basin. It is evident that groundwater quality changes significantly depending on location in the basin.

The SDWMP (Weston Solutions, 2006) developed actions to reduce discharge impairment on water quality. The actions include the following actions:

- Divert dry weather runoff to sanitary sewer systems,

- Install and maintaining in-line separation units and/or end-of-pipe controls along all major storm drains to water bodies,
- Create wetlands to treat urban runoff,
- Enhance existing detention basins,
- Route flows to stormwater detention/retention basins to reduce flooding and to treat runoff, and
- Install Lake Hodges water circulation and/or aeration system.

Additional actions were developed in the SDWMP to address management of animal waste and erosion control (Weston Solutions, 2006). The actions of interest associated with management of animal waste focus on directing flow from storm runoff from grazing areas to catchment basins, detention ponds sanitary sewers, or septic systems before the runoff enters the San Dieguito River and its tributaries (Weston Solutions, 2006).

San Diego is committed to coordinating with responsible parties and regulatory agencies to stay informed on the status and disposition of known contamination in the basin. Furthermore, the City intends to continue to collect water quality data as part of their monitoring program to identify point and non-point sources leading to groundwater contamination. Based on this data San Diego will encourage implementation of land use BMPs as a form of remediation. If correlations between land use and groundwater contamination are observed, then in rare cases, it is anticipated that San Diego will report poor land use practices to enforcement agencies. Enforcement agencies may utilize regulatory programs to ensure that migration of contaminants is controlled.

Actions. San Diego will take the following actions:

- Continue reviewing groundwater quality data collected for potential presence of contamination and include status in bi-annual state of the basin assessment or every 5 years.
- If contaminant detections occur, San Diego will implement the appropriate groundwater protection BMP, report to appropriate enforcement agency (i.e. Regional Water Quality Control Board).

- If contaminant detection occurs, provide the County DEH and others with all information on mapped contaminant polluters and Leaky Underground Storage Tank (LUST) sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells.

- If contaminant detection occurs, identify point and non-point sources of groundwater contamination.

3.6.6 Control of Saline Water Intrusion

The San Pasqual Valley does not extend to the Pacific Ocean, saline water intrusion from a saline or brine water body is not possible. The classification of groundwater is based on TDS concentrations provided in **Table 3-2**.

Table 3-2 – Classification of Groundwater based on TDS (Sutch and Dirth, 2004)

Category	Units (mg/L or ppm)
Fresh	0-1,000
Brackish	1,000-10,000
Saline	10,000-100,000
Brine	>100,000

Groundwater quality data throughout the basin has shown a variety of TDS concentrations ranging from fresh to very low level brackish. The primary water bearing formation within the basin is the alluvial aquifer which ranges in thickness from 200 feet in the east to 120 feet in the west. Beneath the alluvial aquifer exists the residual aquifer which yields a small quantity of water to wells from fractures (Izbicki, 1983). As described in Section 2, based on wells screened in primarily the alluvial aquifer, TDS concentrations range from approximately 700 to 1,300 in the eastern and western portions of the basin, respectively. Groundwater quality in the residual aquifer beneath the alluvial aquifer, based on specific conductance has a median dissolved solids concentration of approximately 1,040 mg/L (Izbicki, 1983). San Diego plans to evaluate the hydrogeologic communication between residual and alluvial aquifers as part an action to improve basin understanding (Section 3.6.7). In addition, as part of San Diego's monitoring program, analyze of trends in sodium, chloride, and TDS will provide an indicator of the potential of upwelling of very low level brackish water from greater depths. However, for these reasons, San Diego plans to take no actions related to saline water intrusion.

3.7 COMPONENT CATEGORY 4: GROUNDWATER SUSTAINABILITY

To ensure a long-term sustainable supply of groundwater for agriculture and reduce dependence on imported water for municipal supply, the City of San Diego is seeking to increase the seasonal volume of groundwater stored in the basin and improve the quality of groundwater over the long-term. These objectives will be met by if an imported water conjunctive use project is implemented in the eastern portion of the basin, and a brackish groundwater desalination project is implemented in the western portion.

The conjunctive use component could be operated in a "put" and "take" mode, allowing for aquifer recharge during periods of high water availability ("put" periods) and the recovery of stored water during periods of low water supply availability ("take" periods). The conjunctive use components may be operated on a seasonal basis, with recharge occurring during winter months and recovery during summer months; or on a carry-over configuration, in which water will be recharged wet years and recovered in dry years.

For the latter configuration, consecutive "put" years could be followed by several "take" years. Nonetheless, the amount of water that can be stored for more than one year without recovery would be limited by the amount of available storage in the basin at any given time.

San Diego has developed conceptual layouts of project facilities assuming seasonal storage and recovery. The dimensions of facilities may be refined during subsequent investigations and modeling efforts, once a better understanding of the basin and its alternative management configurations is gained, in order to allow for a carry-over project.

The desalination component would consist of a desalination facility operating year round and conveying desalinated water directly to the water distribution system in the Rancho Bernardo service area. **Figure 3-6** schematically shows the project components.

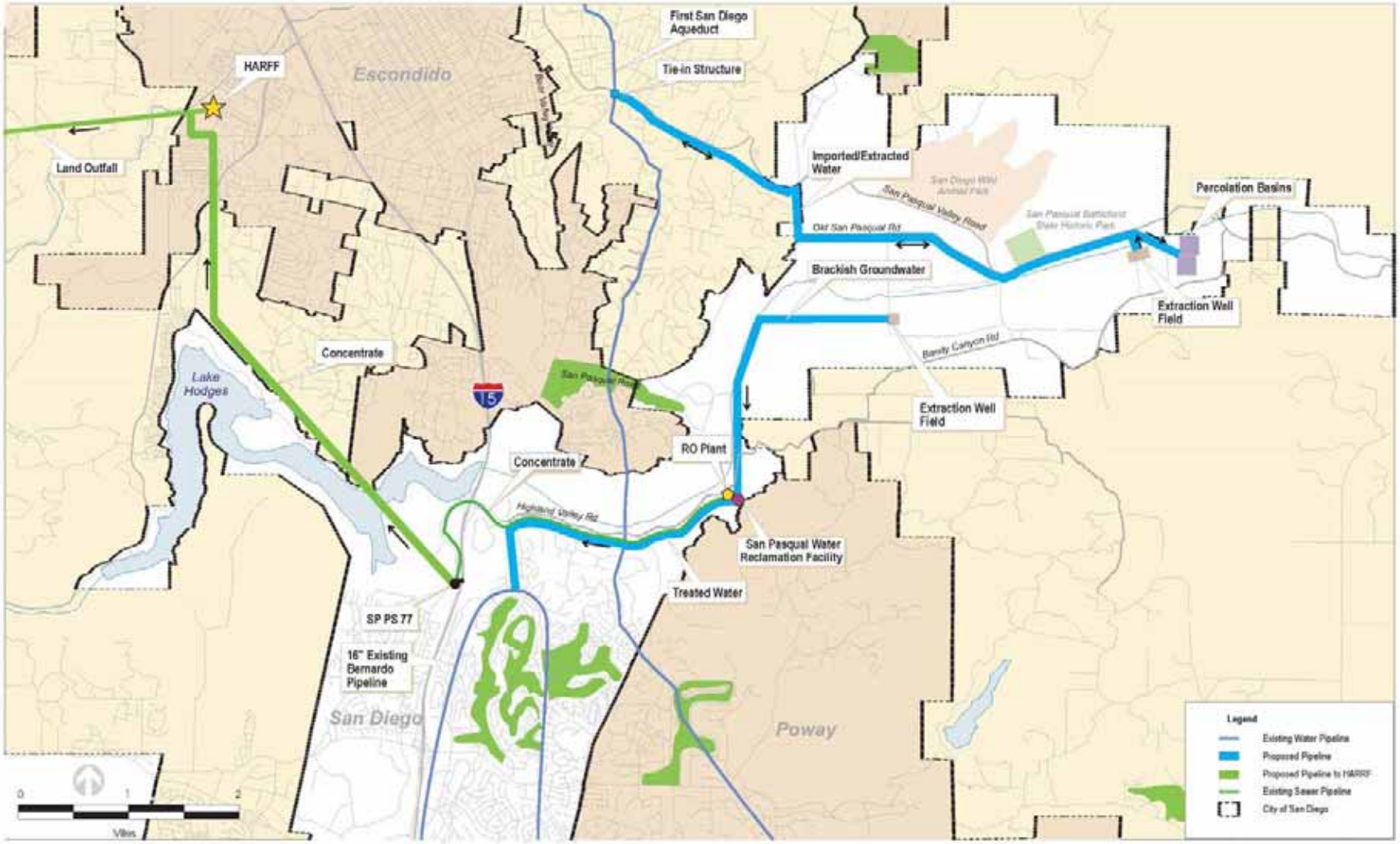


Figure 3-6 - Proposed Water Conveyance and Concentrate Disposal Facilities for Conjunctive Use and Brackish Groundwater Desalination Programs in the San Pasqual Valley

3.7.1 Conjunctive Use Component

The conjunctive use component will consist of recharging and recovering 10,000 AF of imported water. Imported water will be diverted from the First San Diego Aqueduct and recharged to the alluvial aquifer in the eastern portion of the basin by means of percolation basins. During periods of low supply of imported water, stored water will be recovered by means of extraction wells and conveyed back to the First San Diego Aqueduct for use.

A single pipeline will be used to convey imported water from the aqueduct to the recharge areas during recharge periods, and to convey recovered stored water back to the aqueduct for distribution during recovery periods. This line will have an approximate length of 30,000 linear feet and a diameter of 32 inches.

Imported water will be recharged to the aquifer by means of infiltration basins or the river bed during a six-month period. A total of 13 extraction wells with an average yield of 1,000 gpm will be needed to recover 10,000 AF of stored water during a six-month period. These wells will have an approximate depth of 125 feet and will be constructed in a grid with a separation between wells of approximately 500 feet. A pump station in the basin will be required to convey recovered water to the aqueduct.

The possibility of conveying the recovered stored water directly to the distribution system instead of back to the aqueduct, for example to the Rancho Bernardo service area, could also be considered. This delivery option would reduce the cost of the project, but may face regulatory or technical constraints. If treatment other than disinfection is required, some of the cost benefits would be offset.

3.7.2 Brackish Groundwater Desalination Component

This project component entails extracting 5,800 AFY of brackish groundwater from the western portion of the basin and desalinating it by means of a Reverse Osmosis (RO) water treatment plant. Brackish groundwater will be extracted and treated during all 12 months of the year. The water supply produced will be approximately 5,000 AFY, assuming a RO efficiency of 85 percent.

Four extraction wells with an average yield of 1,000 gpm will be necessary to produce, 5,800 AF of water in one year. The RO plant will be located within the San Pasqual Water Reclamation Facility (SPWRF) property. The SPWRF is currently out of service.

Desalinated groundwater will be conveyed to the distribution system in the Rancho Bernardo and Bernardo Oaks pressure zones. These pressure zones have a projected average day demand of 6 to 7 MGD, and thus will be able to accommodate the 4.5 MGD of produced desalinated water. A new 15,000-foot, 18-inch line will be built to connect the desalination facility to the Bernardo pipeline in Rancho Bernardo (see **Figure 3-7**).

Actions. San Diego will take the following actions:

- Continue to investigate conjunctive use opportunities and implement technically, economically environmentally feasible projects. Consideration should be given to improving the understanding of potential contaminant mobilization during recharge and rising groundwater elevations. The City Council approved the start of this project and the contractor received notice to proceed on July 24, 2007.

- Investigate groundwater desalination opportunities on the west side of the basin.

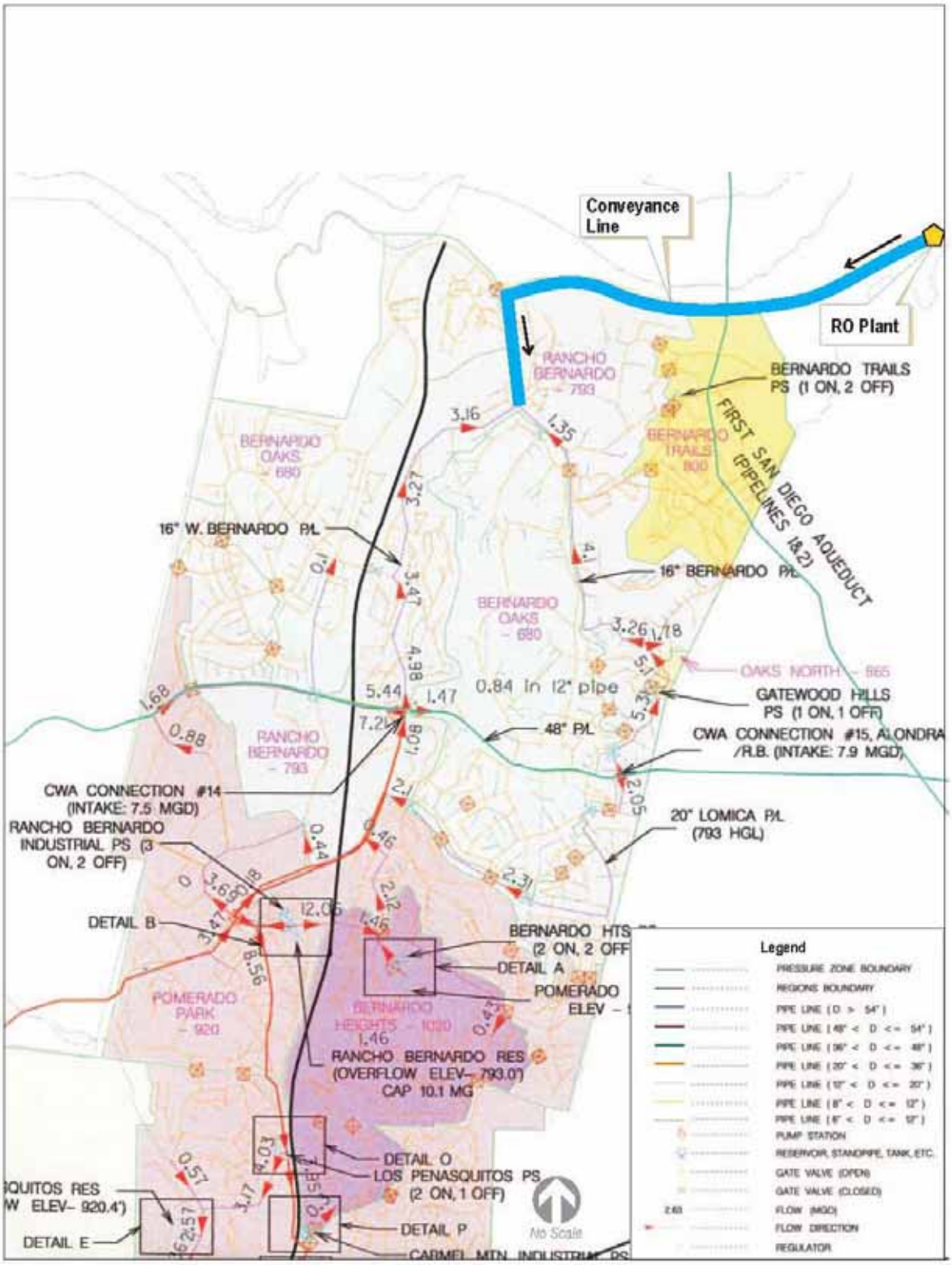


Figure 3-7 - City of San Diego Water Distribution System near San Pasqual Basin

3.8 COMPONENT CATEGORY 5: PLANNING INTEGRATION

With the significant number of water purveyors and Cities serving the San Diego County area, the need to integrate water management planning on a regional scale is a high priority. Individual purveyors and cities derive their supplies from the San Diego County Water Authority (regional wholesaler of imported water as detailed in **Section 1.5.2.2**), groundwater basins, or local surface water runoff reservoirs. Individual purveyor and cities infrastructure systems are mostly independent; where interconnections do exist between purveyors, they are typically for emergency purposes only. This section summarizes the existing planning efforts and efforts currently being developed. It is important to plan the integration of any San Pasqual groundwater projects that may results from this GMP effort as each project may have an impact on local water supplies.

3.8.1 Existing Integrated Planning Efforts

Integrated Regional Water Management Plan – San Diego is now actively participating in the preparation of the Integrated Regional Water Management Plan and will continue to do so in an effort to meet the GMP objectives. San Diego is one of the three agencies (County of San Diego, City of San Diego and San Diego County Water Authority) leading the Integrated Regional Water Management Plan effort.

The San Diego Integrated Regional Water Management planning process is a local water management approach aimed at securing long-term water supply reliability within California by first recognizing the inter-connectivity of water supplies and the environment and then pursuing projects yielding multiple benefits for water supplies, water quality, and natural resources.

The vision of the Integrated Regional Water Management Plan is “An integrated, balanced, and consensus approach to ensuring the long-term viability of San Diego’s water supply, water quality, and natural resources.”

The San Diego Integrated Regional Water Management (IRWM) Plan is being prepared to coordinate water resource management efforts and to enable the San Diego Region to apply for grants tied to IRWM Planning. The completed IRWM Plan will provide a mechanism for: coordinating, refining, and integrating existing planning efforts within a comprehensive, regional context; identifying specific regional and watershed-based

priorities for implementation projects; and providing funding support for the plans, programs, projects, and priorities of existing agencies and stakeholders.

Some Management Actions developed by this GMP may lead to projects such as the San Pasqual Conjunctive Use Storage Project. These projects will need to be integrated in the regional plans and be consistent with other projects undertaken locally and regionally. For example, it will be vital to the San Pasqual Conjunctive Use Storage Project to plan with CWA and other agencies for taking imported water from the aqueduct or putting water back into the aqueduct.

The City of San Diego has already submitted San Pasqual Projects for consideration to this planning group. Projects most relevant to San Pasqual groundwater basin listed under the IRWMP water management strategies for the San Dieguito Watershed are listed below:

- San Pasqual Conjunctive Use Groundwater Project – Feasibility Study
- San Pasqual Conjunctive Use Groundwater Project – Planning/Design
- San Pasqual Groundwater Desalination Project – 5,000 AFY Planning/Design

In addition to these, the County of San Diego is looking at a Comprehensive Groundwater Recharge Study for all San Diego region watersheds. The North San Diego County Brineline Project feasibility Study (lead by SDCWA) will look at a component of the San Pasqual Desalination project: the brine line.

As part of the San Pasqual GMP, the City of San Diego will take the following action:

- Establish a point of contact with the San Diego Integrated Regional Water Management Planning process and be involved in preparing grant application for Prop 50, Prop 84, and future funding, through the IRWMP effort.
- Continue to pursue grant of other funding to implement the adopted plans.

Urban Water Management Planning – The City of San Diego is required to prepare Urban Water Management Plans (UWMP). These plans, as defined by CWC § 10610 et seq., require public water suppliers with more than 3,000 customers or that deliver more than 3,000 AF of water annually to identify conservation and efficient water use practices to help ensure a long-term, reliable water supply. The City of San Diego has submitted

its 2005 UWMP to DWR. The plan builds upon the previously approved City of San Diego Long-Range Water resources Plan (2002-2030) and the Strategic Plan for Water Supply (1997-2015). These documents set water supply goals for future supplies. San Pasqual is a potential future water supply source. The GMP is the first step towards preparing a framework to achieve the water supply goals outlines in the UWMP.

The San Diego County Water Authority also updated its UWMP in 2005. The 2005 UWMP estimates that agencies within the Water Authority's service area used approximately 17,844 AF of groundwater in FY 2005. CWA projects that in 2030 the groundwater supply will be increased to 31,175 AF/yr by the development of various local projects such as the San Pasqual Conjunctive Use Storage Project and the San Pasqual Groundwater Desalination Project listed in the UWMP. This GMP is the first step towards meeting the goals of the UWMP.

Local Investigations and Studies Assistance Grant-funding Program (LISA Program) – In March 2007, the San Diego County Water Authority (SDCWA) sent out a request for proposals to its member agencies to receive grant funding from SDCWA under the LISA Program, established by the Board of Directors in January 2007. The program is being financially supported through funds available under California Senate Bill 1765 (SB 1765). SB 1765 appropriates funding to the Water Authority for the development and implementation of groundwater conjunctive use projects. The overall goal of the LISA Program is to encourage, through assistance in project funding, local groundwater conjunctive use studies and investigations that could lead to local water supply projects that provide new annual core (baseload) supplies or increased dry-year supplies. The City of San Diego submitted an application for the San Pasqual Conjunctive Use Storage Study on April 20th, 2007. The Funding recommendations for the LISA Program – First Funding Cycle were approved by the SDCWA Board on June 28th, 2007. The SDCWA will enter into a funding agreement totaling $750,000 with the City of San Diego for the "San Pasqual Groundwater Conjunctive Use Project". The City will continue to pursue similar local grant funding opportunities like this one.

In support of the San Pasqual GMP, the City of San Diego will take the following action:

- Prepare grant application for Prop 50, Prop 84, and future local or state funding to support the San Pasqual Conjunctive Use Storage Project, the monitoring plan or any other project in the basin.

Land Use Planning – Effective January 1, 2002, state law required (SB610 and SB221) that a water supplier take certain actions to confirm sufficiency of water supply as a condition to approval of some new development projects. These actions involve the development of Water Supply Assessments and Written Verifications at the request of the land use authority. These documents provide an assurance that adequate water supplies are available before a project moves forward. The San Pasqual GMP is anticipates a

As part of the San Pasqual GMP, the City of San Diego will take the following action:

- Participate in relevant Land Use Planning updates

San Pasqual Vision Plan – The Vision Plan addresses specific goals and tasks to be achieved in the San Pasqual Valley. One of them is directly focusing on the San Pasqual Groundwater Basin: "Protect the quality and capacity of the San Pasqual/Lake Hodges groundwater basin - to ensure that this invaluable asset as a water resource is not compromised." This GMP is a first step of a series of steps to achieve that vision.

As part of the San Pasqual GMP, the City of San Diego will take the following action:

- Participate in Vision Plan updates

Source Water Protection Plan – The City of San Diego's Water Department faces significant challenges protecting its raw water supply. This challenge results from much of the watershed lands being outside of San Diego's jurisdictional limits. Thus, much of the watershed lands are outside of San Diego's jurisdictional sphere of authority for land use planning, zoning, and building codes. In 2004, to address this, the Water Department has established a guide for development in and around water supply watersheds aimed at protecting the local source waters; "Source Water Protection Guidelines for New Development." City staff and other local agencies use these Guidelines as part of the development review, comment, and approval process. Land developers use the Guidelines when designing projects located in the areas where water supply could be affected within watersheds.

The Guidelines build upon existing land use, zoning, and building code regulations. They establish water quality control measures, specific to drinking water sources, for construction and new development, and also include recommendations for long-term maintenance of the control measures. Overall, it serves as a road map for sensible

development, increases the reliability of the water supply system, and reduces the cost of drinking water treatment.

The "Source Water Protection Guidelines for New Development Projects" can be downloaded from the following website:

http://www.sandiego.gov/water/operations/environment/swpg.shtml

As part of the San Pasqual GMP, the City of San Diego will take the following action:

- The City of San Diego will include a requirement in its Source Water Protection Plan that the City Water Department will review and comment on proposals for development in the San Pasqual/Hodges watershed

- The City of San Diego will continue to promote the Source Water Protection Guidelines for New Development.

Drinking Water Source Assessment and Protection (DWSAP) Program – The DWSAP Program is administered by DPH. As a first step to a complete source protection program, DHS required water systems to conduct a preliminary assessment. The assessment includes the "delineation of the area around a drinking water source through which contaminants might move and reach that drinking water supply; an inventory of PCAs that might lead to the release of microbiological or chemical contaminants within the delineated area; and a determination of the PCAs to which the drinking water source is most vulnerable."
(http://www.dhs.ca.gov/ps/ddwem/dwsap/overview.htm).

The assessments only apply to agencies that deliver groundwater for public drinking water supply. In 2002 and 2003, the City of San Diego completed DWSAPs for their existing five primary reservoirs and one groundwater well (El Cajon Well).

March 2006 Strategic Business Plan Update – The 2006 update outlines the strategies to be completed in 2006-2010. The fourth strategy is about effectively using existing water resources and obtaining alternative supplies. The corresponding tactics for 2007-2030 include implementing the San Diego Water Department Long-Range Water Resources Plan which recommends to develop and implement programs to meet the following objectives of the plan: Groundwater treatment program - 10 acre-feet per year;

Recycled water program 20,000 acre-feet per year; Groundwater storage program 20,000 acre-feet per year.

The City of San Diego will continue to include groundwater storage as part of their Strategic Business Plan updates.

Summary of Actions. The City of San Diego will take the following actions:

- Establish a point of contact with the San Diego Integrated Regional Water Management Planning process and be involved in preparing grant application for Prop 50, Prop 84, and future funding, through the IRWMP effort.

- Participate in Vision Plan updates, other relevant planning documents (i.e. UWMP, Land Use Planning, etc.) and water resources management activities.

- The City of San Diego will include a requirement in its Source Water Protection Plan that the City Water Department will review and comment on proposals for development in the San Pasqual/Hodges watershed.

- City of San Diego will seek an agreement with all jurisdictions in the drinking water source watershed. This agreement will ensure that those jurisdictions notify the City Water Department for comment on all land use proposals within the drinking water source watershed. Alternatively, San Diego could initiate legislation to add language to CEQA requiring jurisdictions in a drinking water source watershed to notify the water agency responsible for the drinking water source for comment on all land use proposals within the drinking water source watershed.

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Section 4 – Plan Implementation

Table 4-1 summarizes the action items presented in **Section 3** and an implementation schedule. Many of these actions involve coordination by San Diego with other local, state and federal agencies and most of these will begin within 6 months, following adoption of this SPGMP. A few activities involve assessing trends in basin monitoring data for the purpose of determining the adequacy of the monitoring network. These assessments will be made as new monitoring data become available for review by San Diego, and results will be documented in an annual Bi-Annual State of the Basin Assessment (see below).

Table 4-1 - Preliminary Summary of Proposed Management Actions for San Pasqual GMP

	Action Related to BMO	BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
Component No. 1 Stakeholder Involvement							
Involving the Public					✓	✓	✓
1	Update Public Outreach Plan Every Five Years.						D, F
2	Implement Public Outreach Plan Developed for the San Pasqual GMP.						D, F
3	Provide annual briefings to the Policy Advisory Committee (PAC) and invite stakeholders listed in **Attachment A,** including the domestic and agricultural groundwater users, on San Pasqual GMP implementation progress.						B,D,E,F,U
4	Create a new GMP website or use an existing San Diego website to display San Pasqual GMP information. Relevant website content may include outreach material, groundwater levels, groundwater quality and project updates.						B,D,E,F,U
5	Annually review list of stakeholders and update as necessary.						B,D,E,F,U

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
Involving Other Agencies Within & Adjacent to the San Pasqual GMP Area		✓	✓		✓	✓	✓
6	Contact the land use authority in the watershed such as the Cities of Escondido, Poway, and the County of San Diego, to determine interests in considering improved standard to protect water quality.						A,D,F,N,Q
7	Monitor and review new development proposals and projects within the watershed to ensure that these proposals incorporate appropriate measures to protect downstream water quality and water quantity, as described in the SDWMP.						N, O, P, Q
8	Provide copies of the adopted San Pasqual GMP and subsequent bi-annual state of the basin assessments to representatives from City of Escondido, San Diego County Water Authority and the County of San Diego and other interested parties.						A,D,F,O,R,V
Developing Relationships with Local, State and Federal Agencies		✓	✓		✓		✓
9	Establish a formal process whereby jurisdictions in the watershed will notify the Water Department of any new residential, commercial, or agricultural development proposals or projects in the watershed; thus providing an opportunity for the Water Department to review and comment on the development, and verify that measures to protect water quality, as described in the SDWMP are being incorporated into the designs.						N
10	Partner with local, state and federal regulatory agencies to ensure that non-compliance fees are returned to the City of San Diego to fund water resource improvement programs in San Pasqual Basin.						N

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
11	Establish a point of contact within local, state, and federal regulatory agencies that have responsibility for resource management within San Pasqual Basin. Please see list provided in **Attachment A**. Important resource agencies include (but not limited too) Department of Water Resources (DWR), the County Department of Environmental Health (DEH), Regional Water Quality Control Board (RWQCB), U.S. Fish and Wildlife Service, California Dept of Fish and Game, San Dieguito River Park Joint Powers Authority (JPA), USDA / Forest Service - See stakeholder list.						D,F
Pursuing Partnership Opportunities		✓	✓	✓	✓	✓	✓
12	Continue to promote partnerships with water purveyors and municipalities to achieve regional water supply reliability for the City of San Diego in San Pasqual Basin.						
13	Continue to track and apply for grant opportunities to fund GMP activities and local water management/development projects.						A,B,E
Component No. 2 Monitoring Program and Basin Understanding							
Groundwater Elevation Monitoring			✓		✓		✓
14	Identify and select production/monitoring well locations for installation of groundwater elevation data loggers.						M

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
15	Continue to collect and evaluate groundwater elevation data from existing production and monitoring wells.						
Surface Water Flow Monitoring							
16	Continue to collect, evaluate and archive stream flow data from the creeks and streams entering and exiting the basin						
Groundwater Quality Monitoring		✓	✓		✓		✓
17	Continue to collect and evaluate relevant existing production and monitoring well groundwater quality data and further identify water quality constituents of concern.						C,J
18	Evaluate the potential mobilization of water quality contaminants as a result of rising groundwater elevations in response to implementation of a conjunctive use within the groundwater basin.						
19	Periodically collaborate with the U.S. Geological Survey (USGS) and the State Water Resources Control Board (SWRCB) to include monitoring results from the Groundwater Ambient Monitoring and Assessment (GAMA) program in updates to the bi-annual state of the basin assessment.						C,J
Surface Water Quality Monitoring		✓	✓		✓		✓
20	Archive the analytical results of surface water sampling in the SPGMP						

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
21	Collect and analyze surface water samples for stable isotopes to better understand surface water/groundwater interaction						
Surface Water Groundwater Interaction Monitoring		✓	✓		✓		✓
22	Regularly summarize groundwater and Lake Hodges water quality in the bi-annual state of the basin assessments.						I,J,K,R
23	Summarize surface water quality data from existing City of San Diego monitoring points in the Bi-annual State of the Basin assessments.						J,O,P,Q,R
Protocols for Collection of Groundwater Data		✓	✓		✓		✓
24	Determine monitoring network adequacy and periodically review and expand as appropriate to meet the needs of the GMP on a 5 year frequency or on a special project need basis.						L,M
25	Establish protocols for methods and frequency of collection, storing, and disseminating data. These protocols will be documented in the GMP and may be updated in the bi-annual state of the basin assessments.						
Groundwater Reporting and Modeling					✓		✓
26	Determine the need for a numerical groundwater model and re-evaluate the need during development of the bi-annual state of the basin assessment. If deemed necessary, provide resources for maintaining, updating and utilizing a groundwater model. A potential application of a numerical model may be to assist in the development of a basin wide salt balance.						H

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
27	Develop and present a bi-annual state of the basin assessment.						H,L,M,N
28	Review and update of GMP action items bi-annually. This information may be included bi-annual state of the basin reports.						
Evaluate Bedrock Underlying San Pasqual Valley		✓	✓		✓		✓
29	Review well construction information to identify groups of wells screened within alluvial formations and groups screened within underlying bedrock. If information is available, evaluate grouped well data (quality and elevations) to determine if groundwater within the bedrock system is a viable groundwater water supply resource.						N
Data Management System		✓	✓		✓		
30	Bi-annual update Data Management System (DMS) with future groundwater elevation and quality, well construction and lithology, borehole geophysical data and surface water stream gauge data.						
31	Provide City's available resources for maintaining and updating the DMS.						
Component No. 3 Groundwater Resource Protection							
Well Construction Policies		✓	✓				
32	Ensure that future production and monitoring wells are constructed per the County DEH well ordinance and City of San Diego staff understands the proper well construction procedures.						
33	Inform lessees and other groundwater users who are constructing production and monitoring wells of available information related to water quality concerns to assist with proper well siting. This information may be included on the GMP website.						

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
34	Provide lessees and other groundwater users with guidance on the importance and use of exploratory borehole information (lithologic descriptions and geophysical data) in the design and construction of production and monitoring wells. This guidance information may be included on the GMP website.						
Well Abandonment and Destruction Policies		✓	✓				
35	Document well status (active, operational, and currently in use}, inactive {not currently being used, but operational, with potential for future use}, or abandoned {inoperable, or permanently inactive, with no potential for future use}) as part of the well inventory survey completed during the development of the GMP. Based on survey results, if wells are classified as inactive, then resurvey every 5 years to establish current well classification and follow appropriate protocols based on well status change. Abandoned wells, not included in the groundwater monitoring program, should be properly destroyed. Based on survey results, if wells are classified as abandoned, develop phased schedule for well destruction following DWR and/or County DEH standards.						
36	Ensure that land lessees are provided a copy of the County DEH's code and understanding the proper destruction procedures and support implementation of these procedures. A link to this information shall be provided on the "GMP" website.						
37	Follow up with the County DEH on the reported abandoned and destroyed wells to confirm the information has been provided to the DWR and visa versa. The City of San Diego will also keep a record of well status in the groundwater Data Management System.						
Protection of Recharge Areas		✓	✓				✓
38	If groundwater quality monitoring data indicate groundwater contamination, review current and past land use practices to determine adverse impacts on groundwater quality. If correlations between land use and groundwater contamination are						O,P,Q,S

	Action Related to BMO	BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
	observed, then implement Best Management Practices (BMPs) or report to appropriate enforcement agency.						
Wellhead Protection Measures		✓	✓				
39	If a conjunctive use project is implemented, contact groundwater basin managers in other areas of the state for technical advise, effective management practices, and "lessons learned", regarding establishing wellhead protection areas.						
Control of the Migration and Remediation of Contaminated Groundwater		✓	✓				✓
40	Continue reviewing groundwater quality data collected for potential presence of contamination and include status in bi-annual state of the basin assessment or every 5 years.						J,S
41	If contaminant detections occur take the appropriate action to implement groundwater protection BMP or report to appropriate enforcement agency (i.e. Regional Water Quality Control Board).						J
42	If contaminant detection occurs, provide the County DEH and others with all information on mapped contaminant polluters and Leaky Underground Storage Tank (LUST) sites for their information in developing groundwater extraction patterns and in the siting of future production or monitoring wells.						
43	If contaminant detection occurs, identify point and non-point sources of groundwater contamination.						J,O,P,Q,R
	Component No. 4 Groundwater Sustainability						

	Action Related to BMO	BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
Conjunctive Management Activities				✓			✓
44	Continue to investigate conjunctive use opportunities and implement technically, economically environmentally feasible projects. Consideration should be given to improving the understanding of potential contaminant mobilization during recharge and rising groundwater elevations.						
45	Investigate groundwater desalination opportunities on the west side of the basin.						
	Component No. 5 Planning Integration						
Integrated Regional Water Management Planning(IRWMP), Urban Water Management Planning (UWMP), Land Use Planning, and Groundwater Modeling		✓	✓	✓	✓		✓
46	Establish a point of contact with the San Diego Integrated Regional Water Mgt. Planning process and be involved in preparing grant application for Prop 50, Prop 84, and future funding, through the IRWMP effort.						E,F,T
47	Participate in Vision Plan updates, other relevant planning documents (i.e. UWMP, Land Use Planning, etc.) and water resources management activities.						
48	The City of San Diego will include a requirement in its Source Water Protection Plan that the City Water Department will review and comment on proposals for development in the San Pasqual/Hodges watershed.						

Action Related to BMO		BMO No. 1. *Protect and enhance groundwater quality.*	BMO No. 2. *Sustain a safe, reliable local groundwater supply.*	BMO No. 3. *Reduce dependence on imported water.*	BMO No. 4. *Improve understand-ing of groundwater elevation, basin yield and hydrogeology*	BMO No. 5. *Partner with agricultural and residential communities to continue to improve implementation of best management practices.*	Addresses Policy Advisory Committee - Identified Issue or Concern # (See Table 2)
49	City of San Diego will seek an agreement with all jurisdictions in the drinking water source watershed. This agreement will ensure that those jurisdictions notify the City Water Department for comment on all land use proposals within the drinking water source watershed. Alternatively, the City could initiate legislation to add language to CEQA requiring jurisdictions in a drinking water source watershed to notify the water agency responsible for the drinking water source for comment on all land use proposals within the drinking water source watershed.						

4.1 BI-ANNUAL GMP IMPLEMENTATION REPORT

San Diego will report on progress made implementing the SPGMP in a Bi-Annual State of the Basin Assessment, which will summarize groundwater conditions in the San Pasqual area and document groundwater management activities from the previous two years. This report will include:

- Summary of hydrologic conditions and monitoring results, including a discussion of historical trends.
- Changes in well status – constructed destroyed etc.
- Summary of management actions during the period covered by the report.
- A discussion, supported by monitoring results, of whether management actions are achieving progress in meeting BMOs.
- Summary of status of BMO component category implementation.

The State of the Basin Assessment will be completed by April 1st every other year and will report on conditions and activities completed through December 31st of the preceding two years.

4.2 FUTURE REVIEW OF GMP AND RELATED PROGRAMS

This SPGMP is intended to be a framework for the first regionally-coordinated management efforts in the San Pasqual basin area. As such, many of the identified actions will likely evolve as San Diego actively manages and learns more about the basin. Many additional actions will also be identified in the annual summary report described above. The SPGMP is therefore intended to be a living document, and it will be important to evaluate all of the actions and objectives over time to determine how well they are meeting the overall goal of the plan. San Diego plans to evaluate this entire plan within five years of adoption.

4.3 FINANCING

It is envisioned that implementation of the SPGMP, as well as many other groundwater management-related activities will be funded from a variety of sources including San

Diego, state or federal grant programs, and local, state, and federal partnerships. Some of the items that would likely require additional resources include:

- Monitoring for groundwater quality or elevations in non-purveyor wells.
- Reactivation of surface water gauging
- Customization of the DMS interface.

Preparation of SPGMP bi-annual reports.

- Updates of the overall SPGMP.
- Update of data sets and recalibration/improvement of existing groundwater model.
- Collection of additional subsidence data.
- Construction of monitoring wells where critical data gaps exist.
- Stream-aquifer interaction studies.
- Implementation of the SPGMP including:
- Committee coordination.
- Project management.
- Implementation of regional conjunctive use program.
- During year one of plan implementation, an estimate of some of the likely costs associated with the above activities will be prepared.

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